1885–6.

NEW SOUTH WALES.

VOTES

AND

PROCEEDINGS

OF THE

LEGISLATIVE ASSEMBLY

DURING THE SESSION

OF

1885-6,

WITH THE VARIOUS DOCUMENTS CONNECTED THEREWITH.

IN EIGHT VOLUMES.

VOL. VI.

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1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

VOTES AND PROCEEDINGS.

SESSION 1885-6.

IN EIGHT VOLUMES.
(*With Supplementary Cover containing Plans.*)

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LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

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AND

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(Opened 17th November, 1885, prorogued 25th October, 1886.)

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1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

DEPARTMENT OF MINES.

(ANNUAL REPORT OF THE STOCK AND BRANDS BRANCH.)

Ordered by the Legislative Assembly to be printed, 7 July, 1886.

TO THE HONORABLE JAMES FLETCHER, ESQ., M.P., MINISTER FOR MINES.

Sir,

I have the honor to submit herewith the Report of the Chief Inspector of Stock upon working of the Stock and Brands Branch for the year 1885.

The Report discloses a large amount of work performed by the Officers of the Branch during the year.

In view of the recent heavy losses from drought, the returns of the numbers of horses, cattle, and sheep are most satisfactory, showing, as they do, a moderate increase in the number of horses, the number for 1885 being greater than for any year since 1881; while the number of sheep in 1885 exceeds that of any previous year except 1883, and very nearly equals the number for that year. The number of cattle returned for 1885 shows a further decrease, but, as the Chief Inspector points out, this decrease is not wholly due to the drought, but to a large extent arises from cattle runs being converted into sheep stations. The losses of cattle from drought and disease are estimated at 4,656. The clip of wool for 1885 compares favourably with that of the preceding year, and the quantity exported through the adjoining Colonies appears to be steadily decreasing.

According to the estimate furnished it appears that the number of sheep destroyed by tame dogs is greater than by native dogs.

The number of districts more or less affected by noxious plants and weeds points to the necessity for legislation to render eradication compulsory.

Appended to the Report of the Chief Inspector are valuable reports by the Government Veterinarian on Anthrax and Anæmia in sheep, and a report upon the weed *Euphorbia Drummondii.*

I have, &c.,
HARRIE WOOD,
Under Secretary for Mines.

Department of Mines,
1st July, 1886.

*444—A

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The Chief Inspector of Stock to The Under Secretary for Mines.

Sir, Department of Mines, Stock Branch, Sydney, 1 May, 1886.

I have the honor to submit for your consideration my Report on the working of this Branch, for the year ending 31st December last, which is as usual based very much upon Inspectors' estimates, the owners still showing very little inclination to furnish data.

I.—INSPECTORS AND THEIR WORK.

1. *The Inspectors.*

There are now forty-five Inspectors, having charge of fifty-nine Sheep Districts.

2. *The Inspections made.*

The inspections made during the year were as follows :—

Of Stock	13,881
Of Reserves	3,284
Of Pounds	473
Of Pastures	5,126
Of Dogs	450
Total	23,214

This would give an average of 516 inspections made by forty-five Inspectors.

3. *Horses, Cattle, and Sheep inspected.*

Horses.—The number of horses inspected during the year was 54,840, by forty-three Inspectors.
Cattle.—The number of cattle inspected during the year was 644,818.
Sheep.—The number of sheep inspected during the year was 24,022,931. This is an excess of 399,122 on last year's inspection.

4. *Distance travelled by Inspectors during the year on duty.*

The total number of miles travelled by forty-five Inspectors was 185,616, being an average of 4,124 each per annum, and a slight increase on last year.

5. *Prosecutions and Convictions.*

The prosecutions instituted during the past year were as follows :—

Under Sheep Act	133
,, Lands Act, trespass on reserves...	1
,, Brands Act	0
,, Pastures Act	970
Total...	1,103

This shows a very large increase in the prosecutions under the Pastures Acts, and is accounted for by Inspectors becoming better acquainted with the owners in their districts and looking up defaulters.

The number of convictions were :—

Under Sheep Act	115
,, Lands Act	0
,, Brands Act...	0
,, Pastures Act	759
Total	874

II.—HORSES.

1. *The Number.*

By returns the number of horses in the Colony during the twenty-five years previous to and including 1885 was as follows :—

Year.	No.	Year.	No.
1861	251,497	1873	328,408
1862	233,220	1874	334,462
1863	273,389	1875	357,696
1864	262,554	1876	366,703
1865	284,567	1877	328,150
1866	282,587	1878	336,468
1867	278,437	1879	360,038
1868	280,201	1880	395,984
1869	280,818	1881	398,577
1870	280,304	1882	328,026
1871	337,597	1883	326,964
1872	304,100	1884	337,172
		1885	344,697

This shows a slight increase, 7,525, during the year ; and is due to the favourable season.

2. *The different Breeds.*

Draught.—The number returned under this head is—ordinary, 87,047 ; thoroughbred, 12,804 ; total, 99,851.
Light Harness.—The number returned as ordinary is—86,059 ; thoroughbred, 8,337 ; total, 94,396.
Saddle.—The number of ordinary is given as 133,091 ; thoroughbred, 17,359 ; total, 150,450.

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3. *Horses introduced.*

From other districts.—The number of stud horses introduced was 256, and stud mares, 367; ordinary mares, 1,622; and horses, 2,269.

From other Colonies.—The number introduced by sea was—Stud horses, 99; stud mares, 248; and ordinary horses and mares, 1,075.

The number introduced overland was 96 stud mares and 104 stud horses; and ordinary, 205 mares and 151 horses.

From England and other Countries.—The numbers introduced under this head were 11 stud mares and 15 stud horses.

4. *Horses fit for Sale.*

The number returned as being fit for market during the present year is 16,939 draught, 16,827 light harness, and 26,816 saddle.

Of this number it is estimated that 6,804 are suited for the India and China markets.

There were sent from five districts 787 horses to be shipped from Sydney, and from five districts 639 horses to Melbourne for Foreign Countries.

5. *Improvement.*

In forty-one districts the horses are said to be improving. The principal reasons given are—introduction of superior stud horses, breeding from good mares, more attention to the rules of breeding, and better prices obtainable. In thirteen districts the breed of horses is, so far as regards improvement, reported as stationary, and in five districts deteriorating—the reasons given being too much light blood introduced, breeding from weedy mares for racing purposes, and drought.

6. *Diseases in Horses.*

Influenza in horses was reported in several parts of the Colony, and in an outbreak in the Windsor district, Mr. Government Veterinarian Stanley found the disease in an epidemic form of a mild character, the symptoms being slight fever, general debility, loss of appetite and flesh, and swelling of the limbs, the fever lasting for two or three weeks, and usually terminating in recovery—under the proper treatment—*i.e.*, mild fever medicines, with mashes or green food, and rest. Fatal consequences followed in several cases where sick animals were forced to continue at work, or their vitality reduced by purging medicines.

In the years 1842 and 1843, influenza spread through the Colonies in a virulent form, and losses were heavy in consequence of the lungs being the organ most severely attacked; occasional outbreaks have been noticed ever since.

Besides this the only diseases reported were mild attacks of strangles in twenty districts, and a few cases of inflammation, worms, and colic.

In thirty-nine districts the horses are reported to have been entirely free from disease.

7. *Losses in Horses.*

The losses in horses from drought, starvation, wire in chaff, and other accidents as reported amount to 5,102. This must be considerably under-estimated.

8. *Wild Horses.*

The number of wild horses in the Colony is estimated at 9,622, which shows a decrease on the previous year of 472.

9. *Tax on Entire Horses.*

The recommendation which has been repeatedly made by owners in all parts of the Colony that a tax should be imposed on entire horses, comes again from several of the principal horse-breeding districts, and there is no doubt but that the majority of the owners of the largest studs in the Colony are in favour of such a tax.

Among others, Mr. A. A. Dangar, of Baroona, on the Hunter, has taken this matter up, and has brought under the notice of the different Agricultural Societies a practical scheme for imposing such a tax and utilizing the funds which it would raise in the establishment of a system of inspection, classification, and certificate, and in offering prizes for the encouragement of the improvement of the different breeds of horses, which will be found as Appendix A to this Report.

III.—CATTLE.

1. *Number.*

The returns of cattle in the Colony during the twenty-five years ending 31st December, 1885, stand as follows:—

Year.	No.	Year.	No.
1861	2,271,923	1874	2,856,699
1862	2,620,383	1875	3,134,086
1863	2,032,522	1876	3,131,013
1864	1,924,119	1877	2,746,385
1865	1,961,905	1878	2,771,583
1866	1,771,809	1879	2,914,210
1867	1,728,427	1880	2,580,040
1868	1,761,411	1881	2,597,348
1869	1,795,904	1882	1,859,985
1870	2,195,096	1883	1,640,753
1871	2,014,888	1884	1,425,130
1872	2,287,660	1885	1,317,315
1873	3,794,327		

This shows a decrease during the year of 107,815, and for the last ten years of 2,001,904.

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2. *Different Breeds.*

Shorthorns.—The number of pure-bred and stud Shorthorns is estimated at 31,068; and ordinary, 571,491; total, 602,559.

Herefords.—Pure and stud, 15,851; ordinary, 162,506; total, 178,357.

Devon.—Pure and stud, 5,480; ordinary, 49,779; total, 55,259.

Black-polled.—Pure and stud, 208; ordinary, 1,045; total, 1,253.

Ayrshire.—Pure and stud, 665; ordinary, 2,130; total, 2,795.

Alderneys.—Pure and stud, 100; ordinary, 62; total, 162.

Crosses.—Pure and stud, 3,151; ordinary, 473,779; total, 476,930. The crosses are estimated as follows:—Shorthorn and Hereford, 181,212; Shorthorn and Devon, 58,227; Hereford and Devon, 30,535, Shorthorn and Black-polled, 946; Ayrshire and Shorthorn, 3,500; the balance, 202,510 being unrecognizable.

3. *Stock introduced.*

From other Districts.—Stud bulls, 733; stud cows, 235; total, 968; ordinary cattle, 56,374.

From other Colonies by Sea.—Stud bulls, 85; stud cows, 110; total, 195.

Overland.—Stud bulls, 102; stud cows, 281; ordinary cattle, 28,557; total, 28,940.

From England and other Countries.—Nil.

4. *Increase and Decrease of Cattle.*

The decrease (107,815) in the number of our cattle during the year 1885 arises principally through the cattle runs being converted into sheep stations, but lately also to a very considerable extent through severe drought, which has indirectly as well as directly led to this decrease, for the greater part of those owners who thus lost their cattle have restocked with sheep, as sheep have both paid better and suffered proportionately less than cattle from drought.

5. *The "Cast" of Fat and Store Cattle.*

The estimated "cast" of fat cattle to be sent to market during the coming year is 193,064, and store cattle, 144,542. From twelve districts the fat cattle are principally sent to Melbourne; from three districts they are principally sent to Adelaide, and the remaining districts supply the markets of Sydney, Maitland, Mudgee, Bathurst, Orange, and Tamworth. The principal demand for store cattle comes from Victoria, and for breeding stock from Queensland and the far north, where new country is being taken up.

6. *How kept.*

The number of cattle kept wholly in paddocks is returned as 875,938; on open runs, 307,796; and the balance, 133,581, are depastured both ways.

7. *Improvement and Deterioration.*

In thirty-one districts the cattle are said to be improving; in twenty districts they are stationary; in eight districts are deteriorating. The principal reasons given for the improvement are—introduction of good stud stock, more attention and care in selection, also in culling and keeping in paddocks. The reasons given for deterioration are—drought, inattention to breeding, owners getting rid of cattle, and substitution of sheep for cattle.

8. *Their Diseases and Ailments.*

In twenty-nine districts, on 173 runs, the cattle were reported as affected slightly with pleuro-pneumonia; and in thirty districts the cattle are reported as being free from that disease.

In twenty-two of the infected districts the disease was caused by contagion, from infected travelling stock, in four districts its cause could not be traced, and in three districts the disease was said to be latent in the herds.

On sixty-six stations it is reported inoculation checked disease, on sixty-nine stations it was adopted successfully and satisfactorily, on four stations disease apparently stamped out, and on twenty-nine stations inoculation was not performed.

The number of owners in favour of inoculation is given as 3,111; against, 844; undecided, 1,899; and 4,997 opinions not known.

The number of owners in favour of compulsory inoculation in the case of infected herds is given as 2,540; against it, 1,383; undecided, 1,990; and 4,933 opinions not known.

9. *Losses from Disease and Drought.*

The number of cattle reported to have died from Cumberland disease is 460; from blackleg, 212; from swelling in jaw or throat, 2,936; from ophthalmia, 202; from tuberculosis, 146; from red water, 700; total, 4,656.

10. *Pleuro Pneumonia.*

Amongst the information which has recently reached this Colony, with respect to this disease, it is very satisfactory to find that the efficacy of inoculation was confirmed by the International Veterinary Congress, held at Brussels in 1883, at which the nature of the disease and its treatment were fully discussed by the veterinary authorities of the highest standing in Europe and America; and while the Congress expressed its preference for the stamping-out system (the destruction of all animals actually diseased or suspected of being diseased) in the case of herds or lots of cattle where their slaughter was likely to include the whole of those infected, it decided that inoculation should be practised where the infection was widely spread.

There was considerable discussion on the point whether the infection could be conveyed by inoculated to uninoculated cattle, and a majority of the Conference was of opinion that it could be so. This, however, is I think contrary to the experience of these Colonies, where inoculation has been more extensively practised than in any other part of the world—millions of cattle having been inoculated with success.

The proof that inoculated cattle do not convey the infection to uninoculated, lies in the fact that hundreds of our breeding herds have been inoculated, in which calves were of course being almost daily dropped, and if the infection had been conveyed from inoculated to uninoculated cattle (It is not disputed but that germs of the disease may exist at the seat of the inoculation which are capable of setting up the infection

under

under certain exceptional and favourable circumstances), the all but universal result which followed the operation, the speedy cessation of the disease in the herd, and its restoration to health, could not possibly have happened for the inoculated cattle (in some cases the calves' own mothers) would have infected the calves dropped immediately after the operation was performed; these again would have infected the calves dropped subsequently, and in this way the disease would never have been got rid of; whereas it is a well established fact that in the case of large herds of 8,000 and 10,000 head, the infection left them in the course of three or four months after they were inoculated, that is to say, as soon as all the cattle which were affected before they were inoculated had died or recovered, the infection disappeared from the herd; and that practically, at any rate, there is no danger of inoculated cattle conveying the infection to uninoculated, or that inoculation will keep alive and spread the infection.

I would again recommend that inoculation be made compulsory in the case of all herds or mobs, in which the infection shows itself. If this course were adopted, and all cattle actually diseased destroyed, the disease would soon be stamped out in the Australian Colonies.

11. *Tuberculosis.*

The Government Veterinarian, acting for the Board of Health, has condemned several carcases of cattle affected with this disease, slaughtered at the Abattoirs; and it is to be hoped that stock-owners will look to their own interests, as well as that of the public, and eradicate this scourge from their herds; for it not only destroys the value of the stock from a breeder's point of view, but the Health authorities condemn the flesh, as it is recognised as a medium of communicating the disease "Tubercle," *i.e.*, consumption, to human beings.

IV.—SHEEP.

1. *The Number.*

The numbers of sheep in the Colony during the twenty-five years ending 31st December, 1885, stand as follows:—

1861	...	...	6,119,169	1874	...	...	22,797,416
1862	...	...	6,550,896	1875	...	...	25,353,924
1863	...	...	7,169,126	1876	...	...	25,269,755
1864	...	...	9,082,463	1877	...	...	21,521,662
1865	...	...	9,650,106	1878	...	...	25,479,484
1866	...	...	11,644,593	1879	...	...	30,062,910
1867	...	...	15,066,377	1880	...	...	35,398,121
1868	...	...	16,000,090	1881	...	...	36,591,946
1869	...	...	16,848,217	1882	...	...	36,114,814
1870	...	...	16,218,825	1883	...	...	37,915,510
1871	...	...	16,766,012	1884	...	...	31,660,321
1872	...	...	17,873,696	1885	...	...	37,820,906
1873	...	...	18,990,595				

Return of Sheep to Clerks of Petty Sessions.

The number of Sheep in the Colony at 1st January, 1886, as returned to the several Clerks of Petty Sessions for 1885, and the increase or decrease for the year is as follows:—

District.	No. of Sheep on 1st January, 1885.	No. of Sheep on 1st January, 1886.	Increase.	Decrease.	District.	No. of Sheep on 1st January, 1885.	No. of Sheep on 1st January, 1886.	Increase.	Decrease.
Adelong	10,980	24,178	13,198		Byerock				
Albury	410,396	412,740	2,344		Camden	4,485	3,220		1,265
Araluen					Campbelltown	1,868			1,868
Armidale	276,094	399,347	123,253		Cannonbar				
Ashford	8,208	8,615	407		Carcoar	226,768	173,476		53,292
Ballina					Cassilis	151,148	198,924	47,776	
Balranald	1,094,078	885,393		208,688	Casino	2,046	1,608		438
Baradine	73,164	76,830	3,666		Cessnock				
Barmedman	5,400	8,161	2,761		Clare				
Barraba	53,402	123,890	70,488		Clarence Town				
Barringun	60,000	83,900	23,900		Cobar	832,510	1,018,813	186,303	
Bateman's Bay					Cobargo				
Bathurst	185,411	158,130		27,281	Cobbora		48,268	48,268	
Bega					Collector	20,601	21,773	1,172	
Bellinger River					Condobolin	595,428	806,533	211,105	
Bendemeer	40,593	59,449	18,856		Copeland N.				
Berrima	15,109	11,205		3,904	Coolah	180,778	157,181		23,597
Binalong	98,171	72,230		25,941	Cooma	833,965	725,107		108,858
Bingera	176,827	137,268		39,559	Coonabarabran	248,234	302,476	54,242	
Blackville	56,871	56,249		622	Coonamble	725,293	806,889	81,596	
Blayney					Cooranbong				
Boat Harbour					Cootamundra	143,324	221,567	78,243	
Boggabri	69,190	72,453	3,263		Corrowa	329,314	321,613		7,701
Bombala	281,118	260,867		20,251	Cowra	190,347	198,956	8,609	
Booligal	113,696	70,356		43,340	Crookwell	93,476	100,652	7,176	
Bourke	1,186,293	1,707,427	521,134		Cudal				
Braidwood	32,554	45,556	13,002		Cudgen				
Branxton	8,939	9,821	882		Dandaloo	140,612	298,050	157,438	
Brewarrina	677,148	814,041	136,893		Delegate				
Broke	2,320			2,320	Deniliquin	787,480	1,058,530	271,050	
Bulladelah					Denison Town		57,365	57,365	
Bundarra	72,322	117,380	45,058		Denman	1,153	1,201	48	
Bungendore	79,405	80,801	1,396		Dubbo	435,763	567,930	132,167	
Burraga	19,302	22,388	3,086		Dungog				
Burrowa	229,522	287,542	58,020		Eden	750	595		155
Buckley's Crossing					Emmaville	106,040	97,701		8,339
Bulli					Eurobodalla				
Bungwall					Euston				
					Ellabong				

6

District.	No. of sheep on 1st January, 1885	No. of sheep on 1st January, 1886.	Increase.	Decrease.	District.	No. of sheep on 1st January, 1885	No. of sheep on 1st January, 1886.	Increase.	Decrease
Forbes	471,727	615,894	144,167		Obley	98,274	122,755	24,481	
Foster					Orange	54,064	70,401	16,337	
Frogmore		11,132	11,132		Pambula				
Germanton	507,159	477,688		29,471	Parkes	93,739	142,425	48,686	
Gilgandra	30,779	67,956	37,177		Parramatta				
Girilambone	8,500	27,966	19,466		Paterson	800			800
Glen Innes	243,844	389,141	145,297		Penrith	4,504	6,504	2,000	
Gloucester					Picton	1,810	2,100	290	
Gongolgan					Pooncairie				
Goodooga					Pt Macquarie				
Gosford					Pilliga	135,572	171,593	36,021	
Goulburn	224,983	158,036		66,947	Queanbeyan	250,651	264,940	14,289	
Grabben					Quirindi		53,113	53,113	
Grafton		510	510		Raymond Terrace				
Grenfell	132,077	217,244	85,167		Richmond				
Greta					Rockley	77,016	68,370		8,646
Gulgong	62,534	47,036		15,498	Rydal				
Gundagai	371,910	478,863	106,953		Ryde				
Gundaroo	35,402	38,500	3,098		Rylstone	104,904	125,871	20,967	
Gunnedah	518,937	361,383		157,554	Scone	277,346	287,641	10,295	
Gunning	105,482	113,781	8,299		Seymour				
Gladstone					Shoalhaven				
Hargreaves	35,021	16,732		18,289	Silverton	146,036	234,200	88,164	
Hartley	12,579	735		11,844	Singleton	50,481	56,471	5,990	
Hay	1,058,696	1,031,803		26,893	Sofala	5,255	5,769	514	
Hill End	16,687	16,610		77	St. Albans				
Hillston	939,124	2,438,699	1,499,575		St. Leonards				
Howlong	85,281	70,267		15,014	Stroud				
Inverell	280,293	322,716	42,423		Stony Creek				
Jerilderie	149,948	195,550	45,602		Stuart Town				
Jerry's Plains	7,169	4,219		2,950	Sydney				
Jugiong	2,000	15,720	13,720		Shellharbour				
Junee (late Loftus)	18,968	28,906	9,938		Sunny Corner (Mitchell)	4,463	3,857		606
Kempsey					Tambar Springs	51,435	48,918		2,517
Kiama					Tamworth	327,034	434,798	107,764	
Lambton					Taralga	52,448	66,742	14,294	
Lismore					Taree				
Lithgow	9,563	17,562	7,999		Temora	31,711	41,568	9,857	
Louth	400,647	639,397	238,750		Tenterfield	67,571	79,221	11,650	
Liverpool	2,200	552		1,648	Tibooburra				
McLean					Tingha	34,153	33,107		1,046
Macleay River					Tocumwall	98,450	107,139	8,689	
Maitland					Trunkey's Ck.	32,383	29,770		2,613
Manilla	111,711	137,236	25,525		Tuena	45,225	56,586	11,361	
Marengo					Tumberumba	210,136	135,650		74,486
Marsden	165,330	201,719	36,389		Tumut	427,718	312,539		115,179
Marulan	24,295	26,639	2,344		Tweed River				
Mathoura					Ulladulla				
Menindie	602,968	626,527	23,559		Uralla	203,056	299,030	95,974	
Merriwa	129,975	163,304	33,329		Urana	601,038	778,831	177,793	
Michelago	6,770	7,603	833		Wagga Wagga	1,108,408	1,288,590	180,182	
Milton	803	650		153	Walcha	333,320	385,931	52,611	
Moama	124,599	126,549	1,950		Walgett	929,505	887,535		41,970
Mogil Mogil					Wallabadah				
Molong	352,366	297,207		55,159	Wallerawang	11,767	11,579		188
Morangarell	90,046	94,849	4,803		Wallsend				
Moree	426,269	548,945	122,676		Wanaaring	242,514	178,592		63,922
Moruya					Warialda	526,609	490,808		35,801
Moss Vale	6,934	7,050	116		Waratah				
Moulamein					Warren	367,357	553,224	185,867	
Milparinka	108,815	411,519	302,704		Wee Waa	35,121	30,979		4,142
Mount M'Donald	6,851	18,256	11,405		Wellington	166,624	175,421	9,797	
Mount Hope					Wentworth	574,751	493,640		81,111
Mudgee	87,627	109,212	21,585		Wilcannia	279,740	1,339,799	1,060,059	
Mulwala	181,684	216,894	35,210		Windsor	4,120	525		3,595
Murrumburrah	105,686	129,627	23,941		Wingham				
Murrurundi	433,760	344,180		89,580	Wilson's Downfall				
Muswellbrook	26,839	29,691	2,852		Woodburn				
Murwillumbah					Wollar	2,892	2,688		204
Nambucca					Wollombi				
Narrandera	928,312	1,099,732	171,420		Wollongong		1,007	1,007	
Narrabri	339,748	334,594		5,154	Yass	209,484	218,426	8,942	
Nelligen					Yetman				
Newcastle					Young	450,338	449,188		1,150
Newtown					Lots under 500, &c.	1,306,809	904,963		401,846
Nimitybelle									
Nowra									
Nundle	21,628	24,026	3,298						
Nyngan	183,232	383,031	199,799		Totals	31,660,321	37,820,906	8,084,170	1,923,585
Oberon	39,035	28,922		10,113					

7

Increase and Decrease.

This shows an increase of 6,160,585, which is attributable mainly to the favourable season and good lambing in most of the districts, but to some extent also to the introduction of sheep from other Colonies, to restock the runs which had suffered from drought. It is reported that 776,124 were brought across the Border, principally from Victoria.

2. *The different Breeds.*

(1) Merino.

Combing.

Description.	Rams.	Ewes.	Wethers.	Lambs.	Total.	
Pure and stud—Superfine ...	35,256	370,617	80,050	129,937	615,860	
Ordinary	110,766	2,070,854	1,546,848	1,022,547	4,751,015	
					5,366,875	
Pure and stud—Medium ...	61,416	786,624	244,293	460,430	1,552,763	
Ordinary	235,662	5,149,971	2,973,198	2,993,223	11,352,054	
					12,904,817	
Pure and stud—Strong ...	40,721	575,229	284,683	356,029	1,256,662	
Ordinary	85,951	2,971,523	1,672,053	1,793,779	6,523,306	
					7,779,968	
				Total, Combing	26,051,660	

Clothing.

Pure and stud—Superfine ...	7,475	121,394	53,381	61,817	244,001	
Ordinary	20,966	658,326	405,882	197,300	1,282,474	
					1,526.541	
Pure and stud—Medium ...	21,700	169,767	80,346	76,145	347,958	
Ordinary	109,278	2,779,313	2,096,708	1,203,213	6,188,512	
					6,536,470	
Pure and stud—Strong ...	34,516	185.928	119,481	103,521	443,446	
Ordinary	54,228	869,345	713,702	321.705	1,958,980	
					2,402,426	
				Total, Clothing	10,465,437	
				Total number of Merino Sheep		36,517,097

(2) Long-woolled Sheep.

Pure and stud—Lincoln ...	2,761	29.583	19,539	20,603	72,486	
Ordinary...	2,797	58,965	40,635	29,388	131,785	
				Total, Lincoln ...	204,271	
Pure and stud—Leicester ..	1,814	21,088	11,353	11,834	46,089	
Ordinary	2,186	24,203	19,140	13,536	59,065	
				Total, Leicester ...	105,154	
Pure and stud—Downs ...	521	4,167	1,523	2,066	8,277	
Ordinary	1,381	9,071	9,875	4,343	24,670	
				Total, Downs ...	32,947	
Pure and stud—Romney Marsh	144	86	134	9	373	
Ordinary	482	5,078	6,050	769	12,379	
				Total, Romney Marsh	12,752	
				Total number, long-woolled sheep ...		355,124

(3) Crosses.

Crosses of the above breeds (long-woolled) with Merino principally.	8,238	385,042	370,719	184,686	948,685	
				Total, Crosses...		948,685
				Grand Total		37,820,906

3.

3. *Sheep introduced and imported.*

(1.) From other districts in this Colony.—Stud, 2,835; ordinary, 1,195,972; total, 1,198,807.
(2.) Overland from other Colonies.—Stud, 54,405; ordinary, 721,729; total, 776,134.
(3.) By sea from other Colonies.—Stud. 1,829; ordinary, ——; total, 1,829.
(4.) From England and Countries and Colonies other than Australian.—*Nil.*

With reference to stud sheep from other Colonies (class 3), it will be seen, on reference to Appendix B, that 1,592 Sea-borne sheep were offered at the annual sale of stud sheep, held in the month of July last (1885). Of these, 1,536 were from Tasmania, 32 from Queensland, and 54 from South Australia. They were quarantined for eighteen days, and received one dipping with tobacco and sulphur; 953 of these being unshorn, and 639 shorn.

After reaching the stations to which they were taken, these sheep were all duly examined by the proper Inspectors, who were instructed to report on the appearance of the sheep and the effect of the dipping, and from their reports, based principally on the owners' statements, it would appear that, of the unshorn sheep, 1 ewe died, and 2 lambs were dead when dropped, as the owners state, from the effects of the dipping, and that some 35 other sheep suffered in their wool and condition from the same cause. Of the shorn sheep, again, it was reported to the Inspectors that 1 ram had died from the dipping, and that several of the other shorn sheep suffered to some extent from that cause.

Although the owners attribute these losses to the dipping, they are far more likely—so far, at least, as the unshorn sheep are concerned—to have arisen through the removal of sheep before their fleeces were dry, and exposing them to chills on the steamers and in the railway trucks, and the fact that so many sheep are reported as not having suffered in any appreciable degree from the dipping, proves that the dipping was successfully as well as thoroughly carried out, for if the dipping had been improperly administered, far more sheep would have been affected—they were all treated alike.

As was to be expected, it will be noticed that the shorn sheep suffered much less than the unshorn, and owners, unless they are taking their sheep to New England, Monaro, or any of the other upland portions of the Colony, would do well to shear before dipping, and to do so as soon as possible after the sheep are purchased. While the unshorn sheep should be allowed to dry before they are removed from Sydney.

4. *Long-woolled Sheep.*

Amongst the long-woolled sheep the Lincoln is said in a large majority of the districts to give the best returns in wool and in weight of mutton, the cross-bred sheep being second.

5. *The "Cast" of Fat and Store Sheep.*

The annual "cast" of fat sheep for the ensuing season is estimated at 2,862,265, and store sheep, 3,762,955.

6. *How Sheep are kept.*

Paddocked	34,925,220
Shepherded	1,780,654
Both ways	1,115,032
	37,820,906

7. *Condition of the Flocks.*

In thirty-eight districts the sheep are said to be improving; the principal reasons given being—More attention to breeding, paddocking, introduction of high-class rams and ewes, more careful classing and culling, and better season.

In seven districts they are said to be stationary, and in fourteen districts they are deteriorating. The reasons given are—Severe drought, bad pasture, country not suitable, breeding from inferior ewes, bad management, and errors of judgment in selecting rams.

8. *Lambing.*

The general average for the whole of the Colony of the paddocked sheep is returned by Inspectors at 64 per cent., and shepherded sheep at 53⅔ per cent. In thirty-five districts, the lambing was high; in ten districts, ordinary; in five districts, low; and in eight districts, very low. The reason given for the high percentage is the favourable season; while the ordinary and low percentages are attributable to the low condition of the sheep during 1884, bad season, and losses by dogs and eagle hawks.

The paddocked sheep show a higher percentage than the shepherded sheep by 10⅓ per cent.

9. *The Clip.*

Lambs.—The number of lambs shorn in the grease was 4,113,383; the number washed, 42,584; total lambs shorn, 4,155,967.

Sheep.—The number of sheep shorn in the grease was 28,324,595; hot water and spout washed, 38,000; creek-washed, 642,424; and scoured, 267,250.

The average weights of the clip are estimated as follows:—

	Lambs.		Sheep.	
	lb.	oz.	lb.	oz.
Grease	1	12	5	7½
Washed	.....		.....	
Hot water and spout	.....		3	4
Creek-washed	1	8	3	2
Scoured	.....		3	0

Condition of Clip.

In thirty-six districts the clip is reported as good and sound; in four districts, poor, and unsound; n three districts, light but sound; and in the remaining districts, fairly sound but wanting in yoke.

Average per Sheep.

The total clip in the Colony for the year 1885, according to the number of sheep, would be 28,324,595 sheep, shorn in the grease, average clip, 5 lb. 7½ oz. per sheep = 154,900,128 lb.; 38,000 sheep, hot water and spout washed, average clip, 3 lb. 4 oz. per sheep = 123,500 lb.; 642,424 sheep, creek-washed,

washed, average clip, 3 lb. 2 oz. per sheep = 2,007,575 lb.; 267,250 sheep, scoured, average clip, 3 lb. = 801,750 lb. Lambs—4,113,383 lambs, shorn in the grease, average clip, 1 lb. 12 oz. per lamb = 7,198,420 lb.; 42,584 lambs, washed, average clip per lamb, 1 lb. 8 oz. = 63,876 lb.; total clip, 165,095,249 lb.

Exportation of Clip.

The clip grown in the Colony of New South Wales is shipped to England, America, France, and other countries, from the principle ports of the three Border Colonies, as well as from Sydney. The portion of our clip thus shipped from the other Colonies is often mistaken as the produce of those Colonies.

The following is an estimate of the clip shipped at Sydney, and also the proportion sent across the Borders and shipped by the other Colonies at Melbourne, Adelaide, and Brisbane, for the years 1884 and 1885:—

Port of Shipment.	1884.			1885.		
	Greasy.	Washed.	Total.	Greasy.	Washed.	Total.
	lb.	lb.	lb.	lb.	lb.	lb.
Sydney	88,054,285	3,281,142	91,335,427	119,565,541	2,265,685	121,831,226
Melbourne	30,042,541	778,338	30,820,879	32,430,779	336,759	32,767,538
Adelaide	7,216,407	209,387	7,426,394	9,216,164	299,322	9,515,486
Brisbane	695,630	59,676	755,366	886,064	94,935	980,999
	126,008,923	4,329,143	130,338,066	162,098,548	2,996,701	165,095,249

Classing the Clip.

In twenty-six districts the clip is reported as being well classed, and in the other districts it is not considered so, the reasons being—Owners do not think it pays, want of convenience, sheds not large enough to warrant expense, and the difficulty of obtaining competent woolsorters.

Wool-presses.

A great number of different kinds of presses are used; those most in favour are Williams and Robinson's; rack, screw, and pinion presses are used. There is still room for improvement in the mode of pressing, especially by small owners.

Woolpacks.

The woolpacks used are mostly Calcutta and Dundee, of various sizes, from 4 to 6 in. × 2 feet 2 in. to 5 feet 3 in., and the weight from 10 to 12 lb.

On forty-four stations the wool is dumped before leaving.

10. *Sheep-brands and marks.*

Ear-marking.

In most districts the system of ear-marking sheep is now properly carried out, and nearly all the owners approve of it.

Tattoo-marking.

This system of marking is mostly used by owners of stud sheep—not, as yet, to any great extent in the case of ordinary flock sheep; but where tried it has been found to act as a good preventive to sheep-stealing, and a case has just occurred in which a notorious sheep-stealer was convicted, mainly through the tattoo-mark on the sheep, and sentenced to five years' imprisonment.

V.—DISEASES IN SHEEP.

1. *Scab.*

The flocks in this Colony, and in the Colonies of Queensland, Victoria, South Australia, and Tasmania are free from scab. It exists, but to no great extent, in New Zealand and Western Australia, and good progress in stamping out the disease is being made in both these Colonies. It is hoped that they will soon be declared clean. The importation of sheep from New Zealand and Western Australia is prohibited.

2. *Anthrax—Splenic Apoplexy.*

This scourge, which is known in the Australian Colonies as "Cumberland Disease," has, I regret to say, been prevalent during the past year in several parts of the Colony; and an outbreak, which was attributable by the owners to poisonous plants, was investigated and reported on by the Government Veterinarian. His report accompanies this, as Appendix C.

3. *Anæmia.*

This ailment, which had carried off a good many young rams, in the country lying between the Murray and Murrumbidgee, was investigated by the Government Veterinarian. His report accompanies this, as Appendix D.

4. *Foot-rot.*

In five districts the sheep have been slightly affected with foot-rot during the year; the reasons given being—swampy ground, country not suitable. The remedies principally used were arsenic and blue-stone; carbolic acid, paring, &c., with satisfactory results.

5. *Fluke.*

In fourteen districts the sheep were slightly affected with fluke, through depasturing on sour, unsound country. The remedies used were—removing to sound country, salt, tar and turps, sulphate of iron, and salt and sulphur—with good results.

10

6. *Worms.*

No sheep have been reported as suffering from worms.

7. *Supposed Poison Plant—"Euphorbia Drummondii."*

As large numbers of sheep are reported to have been poisoned by eating this plant, the Government Veterinarian put the matter to the test of actual experiment, and found that in its then comparatively ripe state, at least, it is not poisonous, and considers that the losses (of which there is no doubt) have occurred from hoven. His report on the subject will be found as Appendix E.

8. *Losses through Drought.*

Although the returns for the year show a large increase in sheep, yet on reference to the C.P.S. returns it will be seen that in some districts there has been a decrease amounting, on the whole, to 1,923,585 sheep. This decrease is attributable not so much to the drought during the year as to that of 1884.

VI.—PIGS.

As pigs were declared by proclamation of 8th January, 1885, to be subject to the provisions of the Imported Stock Acts of 1871 and 1884, it is necessary that they should find a place in this Report.

According to the latest returns collected by the police, it appears that the number of pigs in the Colony was only 208,694.

It is regretted that more attention is not given by farmers and dairymen to the breeding and fattening of pigs, and until it is so our settlers cannot prosper as they would otherwise do.

This branch of agriculture has been one of the principal means of the great prosperity of American farmers, and it would be well if our agriculturalists, instead of confining their atttention, as they now almost exclusively do, to wheat, maize, and hay growing (which impoverish the soil), would take more to dairying and pig breeding and fattening, which, if properly conducted, will enable the farmer in a large measure to retain the fertility in his land.

By the latest accounts it appears there were in the United States no less than 12,000,000 dairy cows and 41,000,000 pigs. Besides being comparatively few in number, our pigs are as a rule wanting in quality, and stand in great need of improvement.

Disease in Pigs.

On board the ship "Partian" the Veterinary Inspector found disease resembling, in some respects, "swine fever" amongst the pigs; and by his advice they were at once destroyed, and their pens cleaned and disinfected.

VII.—DOGS.

Dogs have also by the proclamation of 8th January, 1885, issued under the Imported Stock Acts, been declared subject to the provisions of those Acts, with the view to prevent the introduction of rabies as it is the opinion of the highest medical and veterinary authorities in England that there is every probability of that disease being introduced if dogs from countries in which it exists are not subjected to a proper inspection and quarantine before being allowed to land.

Happily, as yet, no well authenticated case of rabies has occurred in any of the Australian Colonies. This is mainly attributable to the length of the voyage; but this has of late years been greatly reduced, and every possible precaution should be taken to keep them free from this terrible malady.

The disease has recently been very prevalent in England and other parts of Europe, and also in America, and the whole of the scientific world is anxiously watching the marvellous efforts of the famous scientist, Pasteur, who claims to have succeeded in finding a cure in inoculation for rabies.

It is hoped he will succeed; but however this may be, the proper course for these Colonies unquestionably is to adhere to the regulations now in force, and insist upon a six months' quarantine for all dogs from places outside the Australian Colonies.

An outbreak of rabies is dangerous enough in countries such as England, but here such an occurrence would be attended with much more disastrous results, for with the swarms of tame and wild dogs in the Colonies, and stock of all sorts in such numbers liable to be bitten by dogs if they were to become mad, the consequences would be horrible to contemplate, as all animals are liable to rabies, and they would of course, if affected, bite one another.

The inspection and quarantine of dogs occupy a considerable portion of the Port Inspector's time, for almost every vessel which arrives has dogs on board, and passengers by the Colonial steamers frequently neglect to bring the necessary papers from the Colony from which they came, and thus entail the necessity of inspection and declaration, lest the dogs should be foreign dogs (*i.e.*, dogs from places outside the Australian Colonies), which had been transhipped, and not passed through quarantine.

Foreign dogs, to the nmber of twenty-nine, passed through quarantine during the year.

Disease in Dogs.

Some cases of brain disease in dogs, attended with delerium have been reported as rabies, and in the case of the foreign dogs on board the ship "Tanandera" the Minister, on the advice of the Government Veterinarian, ordered those that had been in contact with the affected dog to be destroyed; he had been killed by order of the captain, who considered him to be rabied, as a prophylactic measure.

Besides these, three of the dogs quarantined became affected with heat apoplexy, and exhibited symptoms in many respects closely resembling rabies. They were for a time quite delirious, but under proper treatment they all recovered.

VIII.—TRAVELLING STOCK.

1. *Trespass on Reserves.*

In twenty-five districts the driftways and reserves for travelling stock are reported to have been frequently, and in twenty-two districts occasionally, trespassed on by neighbouring squatters' and selectors' stock, and in eleven districts they have been free from trespass. Inspectors suggest various remedies, such as fencing in the reserves, appointing caretakers, &c., &c. What, however, is principally wanted (and has been

been repeatedly asked for during the last five or six years) is that the boundaries of the reserves and driftways should be permanently and prominently marked. Until this is done it will be next to impossible for a drover who has not frequently been over a road to know what land he is entitled to feed his stock upon and what not.

Even drovers well acquainted with a road do not know all the reserves upon it, and if they are not fenced off from the alienated land the drovers are unable to run the boundaries, and therefore deterred from making use of the reserves to the extent they would if they knew which was reserved and which alienated land.

Then again, until these boundaries are properly marked Inspectors can neither detect the encroachments, which are in many cases made on them, nor can they with any certainty substantiate the charges for trespass on the driftways and reserves which they have to bring before the Bench. Convictions have no doubt been obtained, and the driftways and reserves are not now trespassed on to the same extent as they were before the Public Watering-place Act of 1884 was passed; but until they are properly marked the object for which they were notified will be attained to only a comparatively small extent.

2. *Grass on Reserves and Driftways.*

In sixteen districts the Inspectors report that there is not sufficient grass on the reserves and driftways in their districts to enable fat stock to reach the market in good condition; in sixteen districts that there is only sufficient in good seasons; and in twenty-six districts that as a rule there is sufficient grass on these reservations.

3. *Ringbarking Driftways and Reserves.*

As the pasture on the driftways and reserves is now very far short of the requirements of the stock traffic, and as the ringbarking of the driftways and reserves used by travelling stock would everywhere largely increase and improve the pasture on them—in some cases to the extent of even 400 and 500 per cent.—it is recommended that this work be undertaken. It would give employment to a large number of the men when out of work, and could be carried out by contract at reasonable rates.

4. *New Roads for Travelling Stock.*

In fifteen districts new roads for travelling stock are required; in forty-two districts no new droving roads are recommended; and in the remaining two districts the Inspectors report that there are no Crown Lands available.

5. *New Reserves for Travelling Stock.*

In twenty-five districts new reserves for travelling stock are required; in thirty districts there are sufficient reserves; and in the balance there are no more Crown Lands available.

6. *Travelling Charges for Stock.*

In sixteen districts travelling charges for stock have been collected on thirty-one separate occasions, the total amount collected being £5,782 2s. 4d., of which £4,361 1s. 6d. has been refunded on appeal to the Boards.

7. *Laws relating to Travelling.*

In fifty-five districts the Inspectors report that the provisions of the Amended Sheep Act relating to travelling stock are working well, and have almost put an end to loafing.

8. *Sheep Travelling for Grass and Water.*

In the case of thirty-four districts the Inspectors report that during the year 5,311,635 sheep passed through, either making for country where they could obtain grass and water, or returning to their own runs. But although this gives some idea of the very large numbers of sheep which had to leave their runs on account of the drought in 1884, and which are here brought under notice principally in returning home, the actual number would not, it is believed, exceed 1,500,000, as the same sheep in several instances had to pass through several districts. Besides these, the Inspectors report 326,106 sheep loafing for sale, but the actual number of these again may, it is thought, be put at 50,000 or 60,000, as sheep of that class usually travel through a great many districts. The same sheep would perhaps be reported by five or six Inspectors.

IX.—REGISTRATION OF HORSE AND CATTLE BRANDS.

1. *Brands registered.*

The number of horse and cattle brands registered up to 31st December, 1885, was 53,488. The number of brands registered during the year 1885 was:—Horse brands (alone), 390; cattle brands (alone), 250; and horse and cattle brands, 934; making a total of 1,564, being an increase of 87 applications on the previous year.

2. *Brands transferred.*

The brands recorded during the year 1885 as transferred were:—Horse brands, 17; cattle brands, 12; horse and cattle brands, 55; total, 84.

3. *Brands cancelled.*

The brands cancelled (horse and cattle) in 1885 were 29.

4. *Address changed.*

The number of addresses of owners changed in 1885 was 46.

5. *Compliance with the Act.*

In fifty-six districts the provisions relating to registration and the other requirements of the Act are reported as being duly carried out, and in the remaining three districts fairly so.

6. *Benefits of the Act.*

In fifty-eight districts the Inspectors, in alluding to the benefits of the Act, report that it prevents duffing, stock stealing, facilitates identification, assists in recovering lost stock, and otherwise is a great convenience and protection to stock-owners.

X.—POUNDS.

1. *Number and Inspection.*

There are 324 pounds in the Colony, some of which are at present closed for want of pound-keepers. The whole of the pounds are inspected periodically by the various Inspectors of Stock. 2.

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2. *State of Yards.*

Thirty-four of the pound yards are reported to be old, and several require renewing, being unfit for the safe custody of stock, eight are reported as not being up the requirements of the Act, and the remainder are said to be in a fair and good condition.

3. *Keeping and Depasturing Pound Stock.*

The provision made for the proper substenance of impounded stock, according to the reports received, are satisfactory. As a rule pound-keepers have now paddocks for the stock.

4. *Management of Pounds.*

The pound-keepers generally are reported to be performing their duties in a satisfactory manner, and the appointment of Inspectors of Stock as Inspectors of Pounds has had a very beneficial effect.

XI.—NOXIOUS ANIMALS.

1. *The Districts in which the Pastures and Stock Protection Act is in force.*

The Act has been brought into operation in all the districts, fifty-nine in number.

2. *Receipts and Expenditure under the Act.*

The amount of assessment paid by stock-owners during the year 1884 was £49,212 13s. 1d., and the amount expended, £67,485 10s. 4d. The amount of assessment raised by stock-owners in 1885 was £61,754 15s. 4d., and the amount expended was £67,432 1s. 8d., the difference being accounted for by the subsidy granted by the Government to the Boards which raised full rates. Three districts are reported to be in debt to the amount of £414 5s. 4d.

In forty-one districts full rates were levied, in two districts half rates, and in eleven districts various rates, while in four districts no rates whatever were levied.

During the year the bonuses paid by the Boards for scalps ranged as follows:—For kangaroos, from 3d. to 1s. 6d.; wallaby, from 1d. to 1s.; wallaroo, 6d; paddymelon, from 3d. to 1s.; wombats, from 2s. 6d. to 5s.; hares, from 6d. to 2s. 6d.; eagle hawks, 10s.; native dogs, from 10s. to 60s.; pups, 2s. 6d. to 10s.; and wild pigs, 2s.

3. *Estimated Number of Noxious Animals.*

The aggregate of the returns by Inspectors of the estimated numbers of noxious animals in their districts shows that there are supposed to be 2,500,000 kangaroos, 2,300,000 wallabies, and 20,000 native dogs in the Colony.

4. *Increase and Decrease.*

The decrease of noxious animals during the past year has in twenty districts been reported as considerable; in thirty-five districts it is slight to fair; in four districts they are reported as increasing.

5. *Number destroyed.*

The number of kangaroos destroyed during the past year was 855,676; of wallabies, 506,372; of wild pigs, 922; of hares, 5,878; of native dogs, 8,474; and of eagle hawks, 55.

6. *Steps taken for their Destruction.*

In the majority of the districts, hunting with dogs, drives, shooting, and trapping have been adopted with satisfactory results. In several of the districts poison has been used with fair to best results, and only from two districts has it been reported as unsuccessful.

7. *Amendments suggested in the Act.*

It is suggested that the Government should administer the Act, that uniform rates be levied, that all assessments be paid to a general fund at the Treasury, that the rates of bonuses be the same throughout the Colony, that all owners make returns of their stock on a particular day, and that all owners should contribute irrespective of the number of stock.

8. *Losses from Tame and Native Dogs.*

The losses in stock for the past year from the ravages of native dogs are estimated at 63,117 sheep, valued at £25,068, and from tame dogs, 69,745 sheep, valued at £29,658, making the loss from tame and native dogs together £54,726.

Special Inspections.

The Forbes Board, at the suggestion of its chairman, had a special inspection made during the year of the runs in the District as regards the prevalence of noxious animals, and where required has called the attention of the owners to the necessity for more effective work. This course might be followed with advantage by other boards.

XII.—COMMONS.

1. *Number and Extent.*

The number of permanent commons in the Colony is 140, with an average extent of about 1,250 acres each. The number of temporary commons is 161, with an average extent of 2,000 acres each.

2. *Number of Commoners, Stock, &c.*

The average number of commoners to each common is estimated at 130, and the average number of stock kept on each common is 223.

In twenty-three districts the commons are reported to be used for other purposes than that of grazing commoners' stock.

XIII.—GENERAL.

1. *Artificial Grasses.*

In twenty-four districts artificial grasses have been sown during the year to a small extent, in fifteen districts to a large extent, and in remaining districts none; the most successful being lucerne, prairie, and rye.

2. *Number and Division of Runs.*

The number of open or unenclosed runs in the Colony is 1,062; the number enclosed is 10,188; the number partially subdivided is 4,427; and the number properly subdivided is 6,305.

3. *Improvements, Fencing, Dams, Tanks, and Wells.*

The number of miles of fencing throughout the Colony is estimated at 823,612, at an average cost of £49 15s. per mile, amounting to £40,974,697.

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The number of dams used for stock purposes is estimated at 17,791, at an average cost of £99 4s., amounting to £1,765,217. Number of tanks, 21,338, average cost of each, £196 5s.; and the number of wells used is estimated at 2,737, at an average cost of £238 each, amounting to £4,839,796.

Cost of fencing, £40,974,697; cost of dams, £1,765,217; cost of tanks, £4,188,300; cost of wells, £651,495; making a total of £47,579,709, as representing the amount expended by way of improvements, &c.

4. *Noxious Plants and Weeds.*

In forty districts the land is reported as being slightly infested with Bathurst burr; and in twelve to a large extent; in four the land is not infested; and three districts not stated.

In twenty-eight districts the land is slightly infested with trefoil burr; in sixteen districts to a large extent; in twelve districts the land is not infested; and from three districts no return is given.

In thirty-three districts variegated thistle is reported to a slight extent; in fifteen to a considerable extent; ten districts are reported as free from it; one, no return.

In twenty-seven districts black thistle is reported to a slight extent; in sixteen, to a great extent; ten districts are reported to be free from it; and from three districts no return is given.

Other noxious weeds are reported to a slight extent from twenty-six districts; to a great extent from twenty-one districts; ten districts are said to be free from them.

Darling pea reported in five districts, and *Euphorbia Drummondii* in three districts.

Prickly-pear is reported as existing to some extent in three districts, largely in two districts, and slightly in one district.

5. *Cost of Clearing Commons, Reserves, &c., of Weeds.*

The cost of clearing the permanent commons of noxious weeds throughout the Colony is estimated at £23,782; the temporary commons, £20,359; the police paddocks, £4,977; the travelling stock reserves, £47,210; and the droving roads at £39,418; amounting in all to (say) £135,746.

6. *Examination of intending Applicants for appointment of Inspector.*

During the year four examinations were held with the following result:—

Date of Examination.	No. of Candidates.	Names of Successful Candidates.	Nature of Certificate issued.
1885.			
January 21	10	Samuel Durham, M.R.C.V.S.	1st Class.
		Mark J. C. Tully	1st Class.
		P. Life Smith	2nd Class.
		G. S. Smith	2nd Class.
February 24	4	John Fraser	1st Class.
		Charles Lyne	2nd Class.
		E. G. Finch	2nd Class.
April 10	1	.....	Failed to pass.
September 29	7	C. J. Vyner, M.R.C.V.S.	2nd Class.
		R. W. Dawson	2nd Class.

From the above it will be seen that twenty-two candidates were examined last year, three receiving first-class and six second-class certificates.

I have, &c.,
ALEX. BRUCE,
Chief Inspector of Stock.

APPENDIX A.

Improvement of the Breed of Horses.

I have long been of the opinion that a great deal of good might be done in this matter, if only legislation could be brought to bear on it, and there is no reason why it should not, if only some member of Parliament, with the welfare of the horse at heart, would seriously take it up. "Stockman" has given the outline of a bill which, with a little alteration, might be made to suit all parties, while if the thing is to work beneficially, I would go further than "Stockman" and compel the registration of all stallions, and the castration of all those that were found to be unfit for stud purposes. I would suggest that until our agricultural societies are federated (as I believe they are in Victoria) the jury could be nominated by the Council of the Agricultural Society of New South Wales, on the understanding that it took the opinions of the committees of the other societies throughout the Colony before making the nomination.

I am, &c.,
A. A. DANGAR.

It has been frequently suggested that an Act should be passed, compelling the owners of entire horses used in the stud to register them, and to pay a fee of £5 or £10 for the registration, with the view to the improvement of our horse stock.

I believe such a measure would be highly beneficial, and by way of improving upon the suggestion and bringing it to a practical issue, I would propose that a bill containing some such provisions as the following should be passed:—

1. That every entire horse used in the stud be registered with the Inspector of Stock for the district in which he is kept, the fee for registration being (say) £5.

2. That the moneys received from registration fees be expended in carrying out the Act, and in the payment of prizes to be awarded to deserving horses.

3. That a jury consisting of two experienced judges of horses and a properly qualified veterinary surgeon, nominated by the Council of the Agricultural Society of New South Wales and appointed by the Governor, attend during the year at (say) twenty of the principal agricultural shows, most conveniently situated, for the purpose of examining and reporting on the entires presented for their inspection.

4. That the jury be paid at the rate of (say) £2 per diem, exclusive of £1 per day for travelling expenses; but, where any of the jury acts as a judge at a show, the society employing him should pay his travelling expenses.

5. That owners be invited to submit their horses for inspection to the jury at one or other of the shows at which they attend.

6. That the entires considered by the jury fit for stud purposes receive certificates to that effect, of three grades, according to the merit of the horse.

7. That such horses as the jury consider deserving be awarded prizes from the moneys collected as registration fees.

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8. That entires considered unfit to be in the stud or unsound, be refused certificates.

The advantages arising from such a measure as this would, among others, be:—

1. That the payment of the registration fee, although it is a low one, would prevent a good many owners from keeping the worthless entires which are now to be met with in every other district of the Colony.

2. It would very soon be the case that no one would patronize a horse for which his owner did not hold the certificate of the jury, and in this way owners would indirectly be obliged to present their horses for inspection, thereby securing the object aimed at by the Act without resorting to what might be termed arbitrary legislation were the inspection made directly compulsory.

3. The societies at whose shows the jury attended in carrying out their inspections would be certain to engage them as judges in all classes in the horse section, and the engagement of paid judges in one section would soon lead to their employment in all the important sections, thereby getting rid of the greatest difficulty in connection with shows, the securing the services of properly qualified disinterested judges.

Then, again, if the judges were paid, it would not be unreasonable to ask from them full reports on the classes they judged, and these reports would be of very great value.

As to the funds for carrying out such a measure, I would imagine that there are at least some 300 entires in the stud in the Colony to be registered, and these, with a registration fee of only £5 each, would bring in (say) £1,500. Of this sum £800 would be required to meet the expenses of working the Act, which would leave (say) £700 for prizes of sufficient amount to induce the owners of the best horses (prizes should only be given for the very best and most useful) to present them for inspection, if the jury's certificate were not of itself sufficient inducement.

I am, &c.,

"STOCKMAN."

APPENDIX B.

Annual Sheep Sales.

The following lots of sheep, bred by the several New South Wales, Queensland, Victorian, Tasmanian, South Australian, and American owners, were disposed of at the annual stud sales held in July last:—

Names of Breeders.	Address.	Number of Rams.	Number of Ewes.	Total.	
				Rams.	Ewes.
Sold by Messrs. Raleigh, Aitken, & Co., on account of					
New South Wales.					
Thomas Armstrong, Esq.	Noorong, Deniliquin	14		14	
Victoria.					
George Cumming, Esq.	Mt. Violet, Darlington	18			
William Lewis, Esq.	Stoneleigh, Beaufort	10	19		
Messrs. John L. Currie & Co.	Larra, Derrinallum	10			
Charles Gray	Nareeb Nareeb	6	18		
Messrs. Thos. Russell & Co.	Barunah Plains, Hesse	12	11		
,, Bailey & Wynnie	Perrmallum, Darlington	20			
,, Wm. Cumming & Son	Mt. Fyans, Darlington	20			
Chas. Ayrey, Esq.	Warramooke, Glenorchy	25			
Sir Saml. Wilson	Ercildoune, Burrumbeet	16			
Sir Saml. Wilson	Mt. Bute	6	14		
Hon. H. H. Wettenhall	Carr's Plains, Glenorchy	16			
Colonel Buchanan	Titanga, Lismore	10	6	169	68
South Australia.					
J. H. Angus, Esq.	Hill River	20		20	
Sold by Messrs. Mort & Co., on account of					
New South Wales.					
A. L. Faithful, Esq.	Springfield	12			
Stephen White, Esq.	Merribindinyah	8	8		
H. R. F. Hume, Esq.	Everton	2	1		
Hon. G. H. Cox	Burrundulla	5			
G. H. F. Cox, Esq.	Binawee	2			
Messrs. J. F. & H. White	Belltrees	4			
Richard Rouse, Esq	Guntawang	19		52	9
Queensland.					
Messrs G. Clark & Co.	Hendon	9	3		
,, Marshall & Slade	Glengallan	16	4	25	7
South Australia.					
Hon. G. C. Hawker	Bungarec	16		16	
Tasmania.					
James Gibson, Esq.	Bellevue, Epping	120	8		
David Taylor, Esq.	St. Johnston, Campbelltown	28	8		
George Parramore, Esq.	Wetmore, Ross	33			
Thomas Parramore, Esq.	Beaufront, Ross	38	10		
Robert Jones, Esq.	Reccarton, Campbelltown	90	14		
W. A. Kermode, Esq.	Morva Vale, Ross	40			
J. B. Gibson, Esq	Perth	41	6		
G. W. Keach	Chiswick, Ross	27	21		
Chas. Field, Esq.	Woodfield, Cressy	17	8		
R. D. Finlay, Esq	Douglas Park, Campbelltown	35	7		
W. H. Bennett, Esq.	Bloomfield, Ross	7	10		
W. Percy Archer, Esq.	Panshanger, Longford	31	12		
W. H. Gibson, Esq.	Fairfield, Epping	47			
W. Gatenby, Esq.	Woodburn, Cressy	32	12		
James Taylor, Esq.	Stewarton, Epping	6			
D. M'Kinnon, Esq.	Dalness, Evandale	31			
James Cox, Esq.	Clarendon, ,,	38			
E. Dowling, Esq.	Quorn Hall, Campbelltown	15			
L. Henry Smith, Esq.	Harland Rise, Evandale	10	20		
Thomas Gatenby, Esq.	Pisa Lake, River	7	19	693	155

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Name of Breeders.	Address.	Number of Rams.	Number of Ewes.	Total.	
				Rams.	Ewes.
Sold by Messrs. Brunker & Wolfe, on account of					
TASMANIA.					
Messrs. Wm. Gibson & Son	Scone	269	17	.....	.....
Thomas Gibson, Esq.	Eskvale, Epping	50	30	.....	.....
Robert Taylor, Esq.	Valley, Field	38	.....	.....	.....
Robert Vincy	Fernhill, Lymington	15	5	.....	.....
Chas. B. Grubb	Strathroy	30	17	.....	.....
Herbert Gatenby	Rhodes	83	.....	.....	.....
R. M'Kenzie, Esq.	Clyne Vale	22	16	.....	.....
A. M. M'Kinnon, Esq.	Mountford	29	.....	.....	.....
G. F. Thirkill, Esq.	Darlington Park, Cressy	5	.....	.....	.....
Miles Bennett, Esq.	Longford	23	9	564	94
Sold by Messrs. Hill, Clark, & Co., on account of					
SOUTH AUSTRALIA.					
Messrs. James Saunders & Co.	Canowie	18	.....	18	.....
Sold by Messrs. Wilkinson, Garves, & Lavender, on account of					
NEW SOUTH WALES.					
F. L. Parker, Esq.	Quiamong, Conargo	50	.....	50	.....
AMERICA.					
M. J. Roberts, Esq.	County Alameda, California	35	33	35	33
	Grand Total	.....	.....	1,656	366

APPENDIX C.

ANTHRAX.

Splenic Apoplexy (Cumberland Disease).

Edward Stanley, F.R.C.V.S., Government Veterinarian to the Stock Branch, to Alexander Bruce, Esq., Chief Inspector of Stock.

Stock Branch Office, Department of Mines, Sydney, 17 December, 1885.

I HAVE the honor to report the result of my examination of the sheep reported to be dying from poison weeds in Lachlan district, and so far as my inquiry went, the report is unfounded.

The sheep are dying from anthrax (Cumberland disease). All my experiments, observations, and inquiries confirm the conclusions arrived at by my predecessor, the late Veterinary-Surgeon Willows, in his very able report (on the same district), dated 13th April, 1883.

The poison plants, *Euphorbia Drummondii*, I found distributed over a large extent of country on sand hills and plains, a very few plants here and there, but never in any quantity; it was quite as plentiful in paddocks where no losses had occurred; there was no direct evidence whatever to prove the theory that it was the cause of the mortality in the neighbourhood I visited. I noticed in many places, on swampy ground, large quantities of a plant that I have since learnt to be named *Myrugyne minuta*, probably from seeds left by floods, it is untouched at the present time by sheep or horses, being very strongly scented may explain their avoiding it, and there was more food than stock, and although said to obtain poisonous properties, I see no reason to attribute the losses to it. Unless pressed by starvation, animals instinctively avoid noxious weeds.

Having been unable to obtain reliable evidence of plant-poisoning, I proceeded to investigate the disease. I made several *post-mortem* examinations, all bearing the unmistakable pathological appearances of anthrax, and the microscope revealed the specific bacteria in the blood, a parasite that develops, multiplies, and obtains its maturity at the expense of the blood of sheep.

It is well known anthrax is propagated by the bacteria escaping from an infected animal with the excretions and nasal discharge tainting the grass, and in that manner enters the stomach of a healthy sheep, and, unless that sheep's blood is in some manner (at present imperfectly understood) able to withstand the germination of the bacteria, the sheep so infected will serve for the maintenance of the bacteria for about forty hours after its introduction, when death ensues.

To prove practically whether bacteria were present, six sheep shut in a pen were fed on lucerne. I took a little blood from one that had died with anthrax, diluted it with water, and drenched the six sheep with it. They immediately continued eating the lucerne, and appeared to be in good health and were chewing their cuds thirty hours after drenching, but ten hours later five of the six lay dead, every one of them undoubtedly having anthrax. No vegetable poison could possibly have produced such results.

I would suggest the following preventive measures:—

(1.) Move the sheep from the infected to healthy runs, and the fatality will cease in five or six days; and, as certain seasons favour the development of the bacteria, arrangements for removal should be made before the disease established itself.

(2.) Burn every carcase completely, and as speedily as possible after death.

(3.) Burn the camps, fences, and earth which are impregnated with the bacterial germs, and bush the camps to make the returning stock select fresh camping ground.

(4.) Wherever practicable burn the whole of the infected paddocks.

As it is very evident some paddocks teem with germs, and thousands of sheep consume myriads of them every day, there must be some condition of their blood which resists the development of the bacteria.

Such a condition is said to be obtained by Pasteur's inoculation with attenuated virus, and I believe there are certain medicinal agents which may safely be introduced into a living animal which will render him proof against the attack of this fatal parasite, but much careful scientific investigation will be necessary before trustworthy results can be expected.

I need not dilate on the importance of this subject, and conclude my report with the suggestion that the Government offer a reward sufficiently substantial to induce scientists to solve the problem, by what means sheep may be protected from the disease anthrax, colonially known as "Cumberland disease."

I have, &c.,

EDWARD STANLEY,

Inspector of Stock.

Minute Paper.—Sheep Diseases, Lachlan District.

Department of Mines, Stock Branch, Sydney, 24 December, 1885.

MEMO.—There is no doubt that the cause of the death of the sheep here reported as investigated by Mr. Government Veterinarian Stanley was Cumberland disease (splenic apoplexy), and I regret to say that the losses of stock through this disease have during the present year been heavy in several parts of the Colony.

It may be that some of the deaths which have been reported have arisen through the stock feeding on poisonous plants, and steps are being taken to settle the question how far the plants suspected of being poisonous are so by feeding sheep upon them.

It will be noticed that Mr. Stanley, in order to satisfy himself as to the true nature of this disease, besides examining the blood of the sheep under the microscope, drenched six sheep with some of the blood diluted with water, with the result that in the course of forty hours five of them died, confirming his own opinion that the disease was Cumberland, and also establishing the fact that the food is at least one vehicle by which the germs of the disease are conveyed to healthy stock.

Mr. Stanley offers some practical suggestions for dealing with the disease which should, I think, be made public for the benefit of stock-owners; but the movement of sheep affected with Cumberland disease should be confined to fresh ground on the owner's own run.

Mr. Stanley also points out the expediency of trying experiments for the prevention of the disease, *i.e.* (1). Inoculation with cultivated or modified virus, as practised by Pasteur; and (2.) Medical agents administered to the sheep which would render them proof against an attack of the disease.

The second preventive could at once be tried with such medicines as Mr. Stanley thinks there is any prospect of being successful, in a thorough and systematic manner. But with regard to the first preventive, inoculation, I believe sufficient information has not yet been obtained in the Colonies to admit of its being properly tested.

I would suggest, therefore, that the necessary information be obtained from those countries in which inoculation has been tried experimentally or practically for anthrax; and if that course be approved, the Hon. the Colonial Secretary might, perhaps, be moved to obtain through the Agent-General the required information from England.

The other countries from which information of value is likely to be got are France, Italy, Germany, and the United States of America, and considerable time would be saved if it could be so obtained through the resident consuls of these countries instead of through the Colonial Office.

The question of offering, as suggested by Mr. Stanley, a reward for the discovery of a preventive for Cumberland disease should, I think, be deferred until the required information is obtained from the countries mentioned and considered by the Government.

ALEX. BRUCE,

To The Under Secretary for Mines. Chief Inspector of Stock.

APPENDIX D.

ANÆMIA IN SHEEP IN THE URANA DISTRICT.

Department of Mines, Stock Branch.

SEVERAL of the sheep-owners in the Urana district having reported that they were losing valuable stud rams from an unknown disease, the principal symptoms of which were swelling of the face, nose, and throat, Mr. Government Veterinarian Stanley was directed to visit the district and report on the ailment.

Mr. Stanley has made the necessary investigation, and considers the disease to be what is termed "Anæmia" (poverty of the blood), and his report, which is herewith, explains, I think satisfactorily, the primary cause of the ailment—*i.e.*, the impoverished nature of the pasturage on which the rams have been kept, and suggests a remedy.

The ram paddocks in which the young rams are depastured, have, it would seem, in many cases become what is termed "sheep sick," that is, the paddocks have not for years had such a spell as to give the good grasses, much less the saline and alterative herbs and plants, a chance of growing. With the rams continually in these paddocks, which are of comparatively limited area, no sooner have the good and nutritious grasses and plants shown above ground than they have been eaten off, and, only the coarse and inferior having been allowed to feed, the pasture is comparatively devoid of nutriment, and especially wanting in salt. I believe, too, that the evil here pointed at has been aggravated during the by-past summer through the rain coming late in the season, and the pasture, as a consequence, had less substance, and was less nutritious, than if there had been good winter rains.

If this be the true explanation—and there is little doubt that it is—owners by adopting the suggestions offered by Mr. Stanley, will be able to prevent, in a great measure at least, a recurrence of the disease; but, to provide a permanent and inexpensive remedy, I would suggest that fresh paddocks be found for the rams, and that cattle be kept for, say, one or two seasons in the ram paddocks. On nearly all the sheep stations there are small herds of cattle which could be put into these paddocks, and where there are not, store cattle could be brought and put on. This would give the ram paddocks a spell without losing a return from the grass.

I have elsewhere called the attention of sheep-owners to the expediency of stocking their runs to a small extent—say one-fifth or one-sixth—with cattle, and systematically spelling their paddocks in order to give the best grasses and plants a chance of seeding and renewing the pasture by keeping the cattle on them in rotation; and I think the outbreak of this disease shows the necessity for the adoption of such a system; for although the deterioration of the pasture is not so discernible on the run generally it is not the less surely going on, especially where there has been overstocking. There is, too, now, I am sorry to say, greater inducements to adopt such a course, in as far as the return from cattle is likely in future, through the fall in the price of wool, to be nearer that from sheep than in bygone years.

ALEX. BRUCE,

The Under Secretary for Mines. Chief Inspector of Stock.

Edward

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Edward Stanley, Government Veterinarian, to Alex. Bruce, Esq., Chief Inspector of Stock.

Stock Branch Office, Department of Mines.

Sir,

I have the honor of reporting, for your information, that I visited the stations of Coonong and Bundure *en route* to Yanko and Coree, prosecuting inquiries into the fatality among the sheep in Urana and the neighbouring district. From information I collected from various sources, I am able to give the following :—

History of the Disease.

For the last three or four years many valuable young stud and flock rams have been dying on several runs, from a mysterious disease, and the mortality has been steadily increasing. This year the losses are estimated at upwards of a thousand rams.

Special features of the Disease.

Only young rams are affected. Both ewe and wether hoggets appear to be exempt, although put into the same paddocks after rams have died in them.

The disease is most prevalent from October to March, becoming less frequent and disappearing as autumn advances.

Most deaths occur between the ages of five and nine months.

The disease is reported as being identical on several stations widely apart, having no connection whatever with each other, the rams being the descendants of different distinct breeds, and are not blood relatives.

The symptoms observed in most cases are an edematous swelling diffused over the face, nose, jaws, and throat, in some cases closing the eyes, nostrils, and mouth to such an extent that suffocation kills the sufferers. In others the symptoms are loss of energy and evident appearance of indisposition, which usually lasts two or three days, until the animal is seen lying dead.

Some few animals are believed to have recovered.

Reports of the symptoms and *post-mortems* very closely resemble the disease anthrax, *i.e.*, Cumberland, swelling of the carcase, frothy discharge, sometimes blood stained, from the mouth and nose, and gelatinous and blood-stained effusions under the skin.

In a four-tooth ram I found the disease in a chronic form, showing emaciation associated with swollen throat, face, and jaws. There were no symptoms of organic disease that could be detected in the living animal. This was killed for examination.

On account of the decline in the mortality at this season of the year, I was only able to make three *post-mortem* examinations of affected animals. The appearances were similar, although in three different stages, all being typical of the disease.

The pathological process are characterized by gelatinous effusions and the absence of inflammatory action, with important alteration in the blood, which produce the condition known as anæmia—poverty of the blood.

The microscope revealed the presence of bacilli, and at once raised the question of anthracis, it being very difficult, from the extreme minuteness of these parasites, without the aid of most powerful objectives and elaborate careful preparation, to determine their true character. I therefore had recourse to several experimental inoculations without being able to transmit the disease. Septic infection resulted in one case, terminating fatally, and this was verified by the *post-mortem* appearances.

Having satisfied myself that the diseased tissue was the blood, and that it was not of a contagious nature, and by experiments that it was not caused by poison weed I proceeded to investigate the sources of the blood supply, namely the food, water, and general management of the animals.

The character of the country is extensive red plains, with the watercourses of the Yanko and Billabong, clumps of box and gum trees, and myall or borec, with salt-bushes and some sand hills and pine ridges.

The water supply is chiefly from tanks supplied by rainfall and some creeks. Although this water is not free from impurities, on the whole it is of good quality.

The herbage on the plains to which the rams are restricted is composed of native grasses, the varieties known as white or silver umbrella, corkscrew, wild barley, oat, and trefoil.

Young succulent grass is plentiful in spring, but its nutritive value is then at its lowest standard ; it is greatest when mature and seed bearing.

The last three years have been unusually dry, consequently fatal to the growth of many weeds that go to make up pasturage for sheep, so that the herbage is deteriorated in its character by adverse seasons and over stocking. I noticed the entire absence of anything green in the ram paddocks ; nothing was left but the tall dry yellow-brown grasses, with seeds from clover burr on the ground.

I came to the conclusion that the ram paddocks were wanting in nutritive food, especially deficient in some essential elements necessary for digestion and assimilation of the grasses.

This was borne out by the rams being in poor condition, although there was apparently abundance of feed, such as it is, and plenty of water.

I observed the entire absence of salt-bush and saline plants, these being kept so closely eaten off by the sheep as to appear to be exterminated in their paddocks, whereas on the other side the fence, several varieties from dwarf saline weeds to high salt-bush flourish, these paddocks being reserved exclusively for horses or cattle. These animals consume salt, but not so extensively as sheep ; for the latter, salt is an important article of diet, as it materially assists nutrition, acting an important part in digestion and assimilation of the food, and the fact of their runs being so free from saline herbage would indicate that they require an artificial supply of this important adjunct to their daily food.

Rock salt has been provided on one run and the sheep have freely honeycombed it, showing that the want of salt is felt by them, and it is proving beneficial.

In every *post-mortem* examination I made, either of diseased or healthy sheep, I found a few ntestinal worms ; these would be destroyed by salt. These parasites in some seasons and localities often prove fatal, especially in young sheep.

The reason the disease is confined to young rams appears to be because they are more limited in their pasture, being kept year after year in the home paddocks for more careful supervision ; hence these ram paddocks have become exhausted in the production of nutritive food.

Male lambs are weaned about four months old, and two or three months later they are rams ; in the natural course of things they rapidly develop all the attributes of the male sex—robust, large frames, with huge horns, and generative apparatus, as well as the growth of wool. Such rapid growth and development

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can only be supported by a highly nutritious diet, both nitrogenous material and mineral salts being appropriated to build up their organism.

It is well known that young rams are (compared with other animals) delicate and less able to bear hardship, disease, or surgical operations. Hoggets, being less valuable, are sent away to rougher country, often into timber paddocks or forests, where weeds, shrubs, and bushes afford abundant variety of feed, and more extended choice, hence they remain in good health on the same runs that their brothers who are being more carefully tended actually die from want of the various elements in their food necessary to their existence.

The cases of disease that I have been able to see, being limited to three, scarcely warrant my giving an opinion as to the disease and its cause, but presuming my theory, founded more on inquiry than on research, is correct, then remedial measures will naturally suggest themselves.

Change of pasture alone should save the lambs.

Spell or rest the ram paddocks for a year.

Put rams on country where salt-bush is growing, such as horse or cattle paddocks, give a liberal supply of salt in troughs roofed to shelter from rain. Crystalized, known as Liverpool-salt, is preferable to rock salt, because sheep can eat it freely without waste, and without loss of saliva from their mouths, which is the great drawback when licking rock salt, and is also injurious, as all their saliva is wanted in their food during the process of rumination and digestion.

Salt requires to be given with discretion, as sheep craving for it may eat in poisonous quantities and die. Half a hundredweight of salt per thousand sheep, given about every ten or fourteen days, is usually considered to be sufficient.

I also recommend the use of artificial feeding where it is desirable to bring rams to early maturity, by giving liberal food. It must always be remembered that the soil is constantly being exhausted, going off as flesh, wool, bone, and horn, and is never replenished by manures, hence chemical elements, such as earthy phosphates, lime, soda, and potash are likely to be exhausted. These are best supplied by giving bran or pollard with chaff in troughs for the three months after weaning, and however impracticable it may read, if a thousand rams can be saved annually to the country by artificial means, the thoughtful will give it due consideration.

I am glad of the opportunity of being able to point out what I believe will prevent the recurrence of a disease which appears to be within the control of those most interested.

I have, &c.,
EDWD. STANLEY, F.R.C.V.S.,
Government Veterinarian.

Since writing the foregoing I have come across an excellent little pamphlet, by W. A. Dixon, F.I.C., F.C.S., Technical College, School of Arts, Sydney, giving an analysis of salt-bush, &c., and compares them with European fodder plants. In his introductory remarks he says :—"For many reasons foreign to the purpose of this paper, it has been too much the interest of every one to let the sheep and cattle of to-day eat the best there is, even if they destroy it off the face of the earth, without regard to what those of to-morrow will do. It seems reasonable to suppose that in our peculiar climate, subject to periods of continued drought, and having in many cases soils peculiarly saline, the plants which have withstood these influences for ages past would be more reliable than others developed under different conditions of soil and climate."

The great differences between the salt-bushes and European fodders is thus shown conspicuously, and the former are placed entirely by themselves; whilst the cotton-bush, as far as the points considered are concerned, ranges itself with the latter.

Ratios of digestible matter of ash, potash, and salt.

	Digestible.	Ash.	Potash.	Salt.
1. Dwarf salt-bush	100	44	7·417	1·024
2. Small salt-bush	100	41	5·607	14·590
3. Salt-bush weed	100	45	8·952	3·581
4. ———	100	47	13·516	5·734
5. ———	100	53	13·751	3·207
6. Old man salt-bush	100	51	7·986	15·403
Average	100	47	9·538	7·689
7. Cotton-bush	100	10	2·541	·847
Meadow hay	100	12	3·207	1·604
Red clover	100	10	3·524	·720
Lucerne	100	12	1·969	·581
Oaten hay	100	8	3·277	·863

In the following columns are given—1st, the percentage of digestible matter (organic); 2nd, the ratio of albuminoids to oil and carbohydrates, or of flesh-forming material to fat-forming, the former being taken as 100.

	1.	2.	3.
1. Dwarf salt-bush	58·58	100	287
2. Small salt-bush	57·96	100	565
3. Salt-bush weed	58·64	100	338
4. ———	58·60	100	362
5. ———	56·14	100	249
6. Blue-bush	54·71	100	174
7. Old man salt-bush	61·48	100	211
8. Cotton-bush	68·09	100	641
Meadow hay	62·36	100	478
Red clover	64·13	100	284
Lucerne	60·95	100	256
Oaten hay	64·38	100	482

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The old-man salt-bush ranks first in nutritive value and contains the highest percentage of common salt, the next being the dwarf salt-bush. It will be seen that the cotton-bush is the most fattening and approaches the nearest in chemical constituents to the fodder plants of Europe, and the fact of its keeping green during the drought makes it a most valuable food. The importance of the preservation of the natural pasturage will be apparent to all, and I commend the pamphlet as pointing out the value of various varieties that should have special care.

EDWARD STANLEY.

APPENDIX E.

Euphorbia Drummondii, Spurge Wort.

It having been reported by some of the Inspectors that this plant was of a poisonous nature, and had caused the death of large numbers of sheep, Mr. Government Veterinary Stanley was instructed to investigate the correctness of these reports. He, therefore, took the opportunity while in the Urana district, where the plant is very generally distributed, to carry out his instructions, and he has, I think, done so in a thorough and exhaustive manner, as detailed in his report, which is herewith.

From Mr. Stanley's report it would seem as was suspected:—1. That, although the statements that large numbers of stock had been lost through eating this plant are correct, it is not poisonous in the ordinary sense of the term. 2. That the deaths have occurred among the sheep from hoven, the same as they do at times through stock eating green lucern, clover, or any other succulent food; and (3) that they have done so almost solely where starved. Travelling sheep had engorged themselves with the plant in a succulent state, and then drunk heavily of water.

Although scarcely necessary, it might perhaps have been more convincing to those who consider the plant poisonous had the experiments actually demonstrated that deaths arise from hoven; but Mr. Stanley has proved it to be a non-poisonous plant, which ought to be sufficient; and, if any deaths should again occur among sheep through eating it, owners and inspectors will now know what to look for, and be able to recognise the symptoms, and thus finally settle the question.

The lessons which I think Mr. Stanley's report teaches—and they are of considerable value—are that the drovers should be careful when the plant is plentiful, and especially when it is succulent, either to water their sheep before they are allowed to feed, or to keep them away from water for two or three hours afterwards, but in no case should the sheep be allowed to eat much of the plant by itself.

ALEX. BRUCE,
Chief Inspector of Stock.

The Under Secretary for Mines.

Report on Investigation of the Weed Euphorbia Drummondii.

Edward Stanley, F.R.C.,V.S., Government Veterinarian., to Alexander Bruce, Esq., Chief Inspector of Stock.

Many specimens of this weed have reached the stock officer from various sources, and to it has been attributed much loss amongst sheep from its supposed poisonous properties.

On inquiry I failed to find any one acquainted with the symptoms of illness produced by the poison, or with the *post-mortem* lesions.

I found the weed freely distributed over a very wide area in the Lachlan and Riverina, and noticed it cropped short, unless it was protected from sheep by a fence, as in a garden, on the railway, in a horse paddock, &c.; in such situations the plant is conspicuous, being very hardy in drought, and in slight rain grows rapidly.

Many observers had seen sheep eat it, apparently with impunity. In two or three instances where sheep had died mysteriously a sheep had been fed on the weed purposely, in every instance without ill effects.

In Urana a large patch of the weed grows on the stock route, and no other herbage is seen for miles. Mr. Brett informed me that last October, just after rain, a drover arrived at this patch with 3,000 sheep that had been starving for three or four days previously; they stopped and ate up the patch of weed, and walked a mile or so on to Urana common to water and camp; in about three hours about 1,500 were lying ill over a space of ground, and 220 died before morning. Symptons: Distended stomach, staggering gait, frothy discharge nose and mouth, unable to rise when down.

The 1,280 sufferers that survived continued to travel next day with the others that were unaffected.

This history is valuable, because the number that died was small, and the recoveries being so large and so quick remove all suspicion of poison.

I attribute the deaths to indigestion and flatulency. Exhausted animals suddenly engorged with food and water, no matter whether from this weed or any other succulent food, would be just as likely to die.

This occurred on the Jerilderie stock route, 2 miles from Urana. Many thousands of sheep have travelled the same road without ill effects.

An opportunity having occurred of testing the effects of this weed, I determined on a few simple experiments. It may be well to mention that for the past six months many sheep have died on different runs in these districts, and during this time the weed has been in much the same condition as it is to-day; it appears to flower and seed at all times, but is more tender and milky after rain than now; after long drought and hot weather, it still thrives, but is smaller and harder in the stems; but still sheep die, although less frequently than in the spring. So that it would be well to experiment again in October or November, if any doubt its poisonous properties at other seasons.

I believe it to be a nutritive herb or plant, and certainly free from any poisonous properties whatever; in its present condition it has a slightly bitter taste, like a dandelion or fresh-cut lettuce stem.

It must be remembered that several nutritious plants and different articles of food belonging to an order or class of poisons are, nevertheless, indispensable to the digestive process of animal life. To the courtesy of Mr. Carse, Yanko Station, I am indebted for the supply of sheep from a healthy flock in which no disease had occurred, and for the weed known as Spurge Wort, or better known as *Euphorbia Drummondii*, growing plentifully in the horse paddock, and for assistance of every kind that I could possibly require for carrying out these experiments, which were greatly facilitated by my obliging assistant, Mr. Inspector Brett.

We put up seven sheep of various ages, and I carefully examined the conditions and health of each, the skin, the conjunctiva, age, sex, pulse, temperature taken by thermometer introduced three minutes, blood examined under microscope for baccilli, noting the state of their evacuations. In

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In most of the subjects the respirations were panting, and the heart's action too excited to be of value. The weather was hot and dry, temperature ranging from 80 degrees to 97 degrees in the shade.

The weed was gathered fresh every day, and given to the sheep morning and evening by three methods :—1st. In its natural state. 2nd. Chopped into small pieces and moistened with water, it was administered with the thumb and fingers put on to the roof of the tongue, was slightly chewed, and swallowed, being followed by the little water left in the pan ; none was wasted. A pound was found to be too large a feed at once, and a half-pound night and morning was taken with ease and comfort, and evidently relished. It has an agreeable odour, like new hay, and a slightly bitter taste. 3rd. Made into a decoction like tea, by steeping 2lb. of weed in one gallon of boiling water, and covering it up one to two hours, drain off, and use when cool ; it has a brownish colour, fragrant smell, and by no means unpleasant taste.

Those drenched fed with less relish than those starved into taking the weed, but showed no nausea or lassitude.

It may be observed that over (fifty-six) 56lbs. of the weed were procured fresh, and used by weight. This was reduced by evaporation and some dirt. The bulk of this weed was consumed by six sheep in six days without the slightest indication of medicinal effect; their spirits never flagged, their general appearance was of perfect health, and their evacuations were normal in quantity, colour, and consistency throughout the experiments.

Paddock sheep do not take kindly to pen-feeding; hence to save time resort was had to hand-feeding and drenching. Each sheep occupied a separate pen. No food was given during the experiments, excepting a handful of salt-bush and chaff. The first time chopped weed was given in troughs to tempt them to eat.

Water to drink was constantly provided in pans, excepting while drenching with the decoction.

The crossbred ewe dropped a male lamb fully developed, and cleansed at once (not abortion). The lamb is three days old, and both are perfectly robust and healthy, the ewe feeding ravenously, and giving plenty of milk.

I made an extract and also a tincture for further analysis in the laboratory, and have handed them to Professor Watt, with a bundle of dry weed. It is well known that sheep after a drought or from enforced hunger, will eat greedily, engorging themselves, of several young succulent plants, such as clover, lucern, growing wheat, and possibly also of this weed, for it grows up very quickly after rain, causing indigestion, fermenting in the stomach, distending the abdomen, producing mechanical pressure on the vital organs, and death from suffocation. Such deaths are not due to poison, but are purely accidental, mechanical and not toxic.

From the experiments made, I can only conclude that the weed is not the cause of the many deaths that have occurred throughout these districts—that, at least, at this season of the year, it is perfectly harmless—and the absence of any medicinal effects from the use of such large quantities makes me doubt its possessing any poisonous properties whatever ; on the contrary, I found it a nutritious weed, and probably of more value than is imagined, being widely distributed, so hardy, and drought-resisting.

I have, &c.,
EDWARD STANLEY, F.R.C.V.S.,
Government Veterinarian.

Sydney : Thomas Richards, Government Printer.—1880.

[1*s.* 3*d.*]

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

AUSTRALASIAN STOCK CONFERENCE.

(REPORT OF.)

Ordered by the Legislative Assembly to be printed, 14 *October*, 1886.

[*Laid upon the Table of the Honorable the Legislative Assembly of New South Wales by the Honorable the Minister for Mines, a copy of the Report of the Conference of Chief Inspector of Stock, Veterinary Surgeons, and Stock Breeders of the Australasian Colonies held in Sydney in September and October*, 1886.]

CONFERENCE of Chief Inspectors of Stock, Veterinary Surgeons, and Stock Breeders, of the Australasian Colonies, held in Sydney in September and October, 1886.

THE Conference commenced its sittings on the 27th of September, and concluded its labours on the 8th of October.

It was called together by the Hon. the Minister for Mines, with the view of assimilating the the regulations in force in the Colonies for the prevention of diseases in stock.

The following representatives were present:—*New South Wales:* Messrs. A. Bruce, Chief Inspector of Stock; R. G. Higgins, Stock Breeder; E. Stanley, F.R.C.V.S., Government Veterinarian. *Victoria:* Mr. E. M. Curr, Chief Inspector of Stock. *Queensland:* Mr. P. R. Gordon, Chief Inspector of Stock; Hon. H. C. Wood, M.L.C., Stock Breeder. *Tasmania:* Mr. T. A. Tabart, Chief Inspector of Stock; Mr. A. Park, M.R.C.V.S., Government Veterinarian; Mr. J. Meredith, Stock Breeder. *New Zealand:* Hon. W. S. Peter, M.L.C., Mr. J. D. Lance, M.H.R., Mr. J. M'Kenzie, M.H.R., Stock Breeders; Mr. G. S. Cooper, Under Secretary, Wellington. *South Australia:* Mr. C. J. Valentine, Chief Inspector of Sheep; Mr. J. Bagot, M.P., Stock Breeder.

The following is a copy of the circular letter, dated 30th July, by which the Conference was called together:—

"Sir, Colonial Secretary's Office, Sydney, 30th July, 1886.

"Referring to my letter of the 8th February last, in which attention was invited to the desirability of assimilating the regulations in force in all the Colonies relating to sea-borne sheep, I have now the honor, at the instance of my colleague the Secretary for Mines, to enclose, for the consideration of your Government, a copy of a minute by the Chief Inspector of Stock for this Colony, with reference to the holding of a Conference in Sydney for the purpose above mentioned, and to suggest that each Colony be represented at such Conference by its Chief Inspector of Stock, and two gentlemen connected with stock breeding."

The Conference was opened by the Minister for Mines, who pointed out the vast interests with which the Conference were about to deal. He said that the value of horses, cattle, and sheep, in the Colonies was estimated at £78,994,871, and the income therefrom £33,669,973. Taking the capital value of land with improvements and plant and the capital value of stock, the total was £359,000,000.

The Minister having declared the meeting opened, withdrew, and Mr. A. Bruce was appointed Chairman.

Resolutions on the following subjects were agreed to:—

1. Treatment of the different diseases in animals.
2. Regulations relating to the introduction of Australian animals—(1) by sea, (2) by land.
3. Regulations with respect to the introduction of foreign animals, *i.e.*, animals from places outside the Australasian Colonies.
4. The collection and publication of information with respect to diseases in animals.
5. Regulations in regard to the travelling, movement, or conveyance of animals.
6. The destruction of noxious animals.
7. The destruction of weeds and noxious plants.
8. The branding and marking of animals.
9. Any other subject which may be suggested and agreed to by the members of the Conference, connected with the object for which it is convened.

The resolutions passed by the Conference will be found appended to this Report. Its proceedings will shortly be printed, together with a report, taken by a shorthand writer, of all that took place on each sitting day; and copies of the proceedings and report will be forwarded to the Representatives of the several Colonies, with the view to their being submitted to their respective Governments.

ALEX. BRUCE,
Chairman.

RESOLUTIONS PASSED BY THE CONFERENCE.

1. *Preliminary.*

1. That each Colony have three votes.
2. That the following be the order of business:—
   (1.) The consideration of Regulations with respect to diseases.
   (2.) Regulations relating to the introduction of Australian animals—(1) by sea, (2) by land.
   (3.) Regulations with respect to the introduction of Foreign animals.
   (4.) The collection and publication of information with respect to diseases in animals.
   (5.) Regulations in regard to the travelling, movement, or conveyance of animals.
   (6.) The destruction of noxious animals.
   (7.) The destruction of weeds and noxious plants.
   (8.) The branding and marking of animals.
   (9.) Any other subject which may be suggested and agreed to by the members of the Conference connected with the object for which it is convened.
3. That the term "Australasian Colonies" comprise the Colonies on the continent of Australia, also Tasmania and New Zealand; and that the term "Foreign" shall be held to include all other parts of the world.

2. *Diseases in Animals.*

4. That Legislative power be taken to compel the destruction of all animals which have died of or are suffering from anthrax, and that all other animals which have been in contact with the diseased animals be, where practicable, placed in proper quarantine until certified free from disease.

5. That the travelling, selling, or offering for sale, or slaughtering for food of any animals affected with the disease known as tuberculosis, or the using of cows affected with tuberculosis for dairy purposes, be punishable by law.

6. That power be taken to destroy animals actually diseased with pleuro-pneumonia, that penalties be enforced for leaving diseased animals or dead bodies undestroyed, and that stockowners be compelled to give notice in writing of every outbreak of the disease to the Chief Inspector of Stock, and to the nearest Inspector of Stock.

7. That the Conference desires to express its belief in the efficacy of inoculation as a preventive of pleuro-pneumonia.

8. That inoculation for pleuro-pneumonia be not made compulsory.

9. That communication be opened with M. Pasteur with a view to ascertain whether the virus or contagium of pleuro-pneumonia has been, or can be cultivated, apart from the living subject, and if so to state the mode of cultivation; as also the best methods of preparing and preserving virus for inoculation.

10. That all sheep infected with catarrh be destroyed; that the owners be recompensed to two-thirds the value of sound sheep at the date of destruction, and that the run or place on which the sheep were pasturing be strictly quarantined for six months.

11. That as the conditions are so various in the different Colonies, each Colony should legislate for itself where practicable on the subjects of fluke, worms, and foot-rot in sheep.

12. That the Government of Western Australia be urged by the Governments of the Colonies represented at the Conference to take all possible steps for the speedy eradication of scab.

13. That the Conference, having heard from Mr. Lance, one of the New Zealand delegates, the steps taken by the Government of that Colony with regard to scab, are satisfied that the stringent measures being adopted will result in the speedy eradication of the disease.

14. That the several Governments obtain power, in the event of an outbreak of scab, to destroy at their discretion the infected sheep, and those that have been in direct or indirect contact with them, and to take every other means for the absolute and immediate eradication of the disease.

15. That steps be taken by the several Australasian Colonies to thoroughly eradicate ticks and lice in sheep.

16. That any animals found to be infected with glanders, farcy, foot-and-mouth disease, rinderpest, sheep pox, swine fever, rabies, trichinosis, or any other infectious or contagious disease not existing within the Colonies be at once destroyed.

17. That it is desirable that an efficient and competent staff of inspectors of stock be maintained in each Colony, to prevent the introduction and to arrest the spread of scab or any other contagious or infectious disease.

3. *Interchange of Australian Animals.*

18. That no sheep brought from any of the Australasian Colonies in which scab exists be introduced into any of the other Australasian Colonies.

19. That no Colony shall be deemed to be a clean Colony in which scab exists or has existed within the next preceding twelve months.

20. That no breeding sheep shall be imported except by vessels that have not traded to any but a clean Australasian Colony within the next preceding six months, nor by any vessel which shall within that period have had any sheep on board from any Colony or Country other than a clean Australasian Colony.

21. That all breeding sheep be accompanied by a certificate of an inspector of sheep, or a declaration of health certified by an inspector of the Colony from which they came that such sheep are clean, and that scab has not existed there for the preceding twelve months.

22. That imported breeding sheep from any of the Australasian Colonies before they are allowed to go at large in any other Australasian Colony, be placed in quarantine until they have been once dipped in a tobacco and sulphur or lime and sulphur dressing.

23. That the temperature of the dip be not less than 100, nor more than 110 degrees Fahrenheit.

24. That the sheep swim and be completely immersed while in the bath, and the bath to last from one to two minutes, according to its temperature, and as the case may require.

25. That no straw, litter, or excreta with, or about imported sheep, be landed; and that all fittings, cases, or cages brought with such sheep and landed, be cleansed and disinfected as the Chief Inspector shall direct, or be re-shipped.

26. That it be not necessary to dip fat sheep imported from any clean Australasian Colony to another Australasian Colony solely for the purpose of slaughter; provided that such sheep be slaughtered in accordance with the regulations of any such Colony for such description of sheep.

27. That stock, unless from Western Australia, which are allowed by law to travel in the Australasian Colony in which they have been bred, or into which they have been introduced, in accordance with the law there in force, be allowed to enter any neighbouring Colony by land at any lawful place of entrance without further obstacle, unless it be found, on examination by an Inspector of the Colony into which it is proposed to introduce such stock, that they are infected with some disease which is held to be contagious or infectious by the law of such Colony; or unless such Inspector has reason for suspecting the presence of contagious or infectious disease in such stock; and the fact that stock are held to be free from disease in any Colony, and so allowed to go at large, be *primâ facie* evidence of their freedom from contagious or infectious disease.

28. That where an outbreak of disease occurs in any Colony the neighbouring Colonies may, pending the extent and risk of the outbreak being definitely ascertained, at once issue a prohibition against the introduction of stock from such Colony; and that the duration of the prohibition depend upon the amount of risk arising from such outbreak.

29. That the Conference desires to express its strong opinion, in view of the prospect of the assimilation of the stock regulations of the different Colonies, and the great desirability for the freest interchange of stock, that it is undesirable that any duty be charged upon stock going from one Colony to another.

4. *Introduction of Foreign Animals.*

30. That the time has arrived when the prohibition on the importation of cattle and sheep from the United Kingdom, may, under proper restrictions, be safely removed, and that the Governments of Australasia be requested to give effect to this resolution.

31. That the importation of goats and deer be prohibited except for Zoological Gardens.

32. That the importation of pigs be prohibited, as Swine Fever is prevalent in England.

33. That foreign dogs landed in any Australasian Colony be detained in quarantine at a special place set apart for the purpose by the Government of each Colony for a period of six months from date of arrival.

34. That camels be inspected on arrival by an Inspector of Stock and a veterinary surgeon, and if they are not infected with disease they be permitted to land, and be quarantined for the same period as cattle, namely, 120 days; that if they are infected with foot-and-mouth disease or rinderpest they be destroyed; and that all camels suffering from any skin disease be treated in such manner as the Chief Inspector shall direct, and under his control.

35. That the following be included among the regulations under which foreign stock are admitted into any Australasian Colony:—

(*a.*) That foreign stock leaving any district for export to any of the Australasian Colonies, be accompanied by a declaration of cleanness from the owner or breeder.

(*b.*) That all foreign cattle and sheep be taken direct from the place from which they start to the port of shipment; and if they do not travel on foot they be conveyed in a goods waggon, and not put into any conveyance, stable, or other place where animals liable to the same diseases have been within the next preceding 60 days.

(*c.*) That all animals exported to Australasia be shipped from the port of London.

(*d.*) That the Agents-General for the several Colonies be asked to appoint one (*i.e.*, the same) registered veterinary surgeon to examine all stock intended to be exported to any of these Colonies; such veterinary surgeon to give a certificate of health to accompany the animals.

(*e.*) That the skins of all animals which may have died or been slaughtered on board any foreign vessel during the voyage, and not destroyed or thrown overboard, be salted and securely packed in cases or casks, and not landed.

(*f.*) That foreign animals be only admitted at such port or ports as shall be declared quarantine ports for such animals.

(*g.*) That a declaration be obtained from the captain of the vessel as to the health of foreign stock on board on arrival in port.

(*h.*) That the introduction by sea or land of any animal or thing infected or suspected of being infected, be prohibited.

(*i.*) That if foreign animals are infected, they be destroyed or disposed of as the Minister directs.

(*j.*) That if any foreign animals are brought to a port or place in an Australasian Colony, but are not intended to be landed, they be examined by an inspector or veterinary surgeon, and if found free from infectious or contagious disease, removed to quarantine, and there kept until the sailing of the vessel, the expense of their detention in quarantine being defrayed by the owner. If their owner refuse to send the animals to quarantine, they be forthwith destroyed on board.

(*k.*) That foreign horses be admitted without quarantine if found, on inspection by a properly qualified veterinary surgeon and inspector of stock, to be free from disease.

(*l.*) That foreign animals intended to be landed in the Colonies be examined by a veterinary surgeon and an inspector of stock, who shall report to the Chief Inspector of Stock whether or not such or any other animals on board such vessel are infected. (*m.*)

(*m.*) That if foreign animals other than horses are not prohibited, and are reported free from infection, and if the Chief Inspector be satisfied that they are not infected, they may, after being washed and disinfected as he shall direct, be landed for quarantine on sufficient bond and guarantee.

(*n.*) That all foreign animals be conveyed by water, at the owner's risk and expense, to quarantine, and remain for the terms respectively prescribed for the different kinds of animals, at their owner's risk and expense, and that they be washed, dipped, and disinfected, as the Chief Inspector of Stock shall direct.

(*o.*) That the period of quarantine for cattle be 120 days.

(*p.*) That all foreign sheep landed in any Australasian Colony remain in quarantine for a period of not less than 90 days.

(*q.*) That all foreign sheep landed in the Colonies forthwith receive two or more dressings with tobacco and sulphur or with lime and sulphur, at intervals of from ten to fifteen days between each dressing, with the medicaments of the strength, at the temperature, and for the duration prescribed in regard to imported Australasian sheep.

(*r.*) That on the expiry of the term of quarantine prescribed for foreign animals, they be examined by a duly qualified veterinary surgeon and an inspector of stock, and released on the order of the Chief Inspector.

5. *Publication of Information re Diseases.*

36. That the several Governments be invited to collect, publish, and exchange all original useful information with respect to diseases in animals, and their prevention and cure.

6. *Regulations re Travelling and Movement of Animals.*

37. That regulations in regard to the travelling, movement, or conveyance of animals, be left to be dealt with by each Colony within its own boundaries.

7. *Destruction of Noxious Animals.*

38. That as the skins of marsupials have become so valuable, the several Governments of the Colonies in which marsupials exist instruct the Vermin Boards, or others who have the administration of the law, not to levy assessment for the coming year or for such further period as may be deemed advisable.

39. That the means at present available for the destruction of rabbits are most costly, and are not radical cures, and that until some discovery shall have been made more searching and fatal in its effects upon rabbits than anything at present known their absolute eradication cannot be accomplished. The Conference therefore recommends that a bonus be offered by the Australasian Colonies collectively for the purpose of bringing about such a desirable object; such bonus to be granted under such regulations as to success as the Colonies may consider desirable.

8. *Destruction of Noxious Plants.*

40. That the Governments of the several Colonies, where they have not already done so, take power to make the destruction of noxious plants, such as prickly pear, Californian thistle, Bathurst burr, Noogoora burr, and other plants injurious to wool, stock, or pastures, compulsory.

41. That collections be made of all plants suspected of being poisonous to stock, with the view to their true character being ascertained by analysis, feeding of stock, and otherwise, and to the necessary steps being taken to prevent, as far as possible, losses to stock by such plants as are found to be poisonous.

9. *The Branding and Marking of Animals.*

42. That only such ear-marks as are authorized by the Governor-in-Council and registered with the Inspector for the district be used for sheep; that the "tip" mark be prohibited; and that all ear-marks be made with pliers.

43. That any stockowner owning runs in different Colonies, with the sanction of the Registrars of Brands, be permitted to register in each Colony the brand in use by him and registered in his name in either Colony, and that it be a recommendation of the Conference that such Colonies as have legislation on the subject so amend their Brands Acts as to give effect to this resolution.

44. That the dew-lap mark be reserved in all Colonies having legislation upon the branding and marking of stock as a distinctive mark for spayed cows.

45. That the distinctive mark in use in Queensland—taking the tip off the off (*i.e.* the right) ear, be used throughout the Colonies, as the sign of inoculation.

10. *Additional.*

46. That all drafts of laws or regulations dealing with the diseases of animals be, as far as practicable, submitted by the Government framing them to the Governments of the other Colonies for remark before they become law.

47. That it is desirable that regulations be framed on the resolutions passed by the Conference so that the regulations and relative certificates in each Colony may, as far as practicable, be the same in all the Colonies.

48. That the Conference recommends to the Queensland, South Australian, and Western Australian Governments the desirability of exercising the greatest possible vigilance with respect to their northern ports to prevent the introduction of disease from Eastern, Indian, or Chinese ports.

49. That the Conference, taking into consideration the importance of the subjects that have come before them for discussion and decision, are of opinion that an Australasian Stock Conference should be held triennially at the chief city of one of the Colonies, and they respectfully offer this recommendation to the several Governments.

Sydney: Thomas Richards, Government Printer.—1886.

[3*d.*]

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

LIVE STOCK AND AGRICULTURE.

(RETURNS FOR YEAR ENDED 31 MARCH, 1886.)

Ordered by the Legislative Assembly to be printed, 12 *May,* 1886.

LIVE STOCK.

RETURN of LIVE STOCK in each ELECTORAL DISTRICT of the COLONY, for the Year ending 31st March, 1886.

Name of Electoral District	No. of Stockholders.	Description of Stock.				Totals.
		Horses.	Horned Cattle.	Sheep.	Pigs.	
		No.	No.	No.	No.	No.
Albury	220	1,775	4,047	65,732	1,769	73,323
Argyle	1,124	8,147	29,493	352,388	4,927	394,955
Balmain	22	48	93	5	9	155
„ Miscellaneous	.....	670	605	2,788	157	4,220
Balmanald	358	6,841	8,723	2,579,601	1,103	2,596,268
The Bogan	807	9,146	27,181	2,420,940	2,646	2,459,913
Bourke	531	13,937	93,347	5,180,161	1,180	5,288,625
Braidwood	394	3,323	20,557	48,298	1,573	73,751
Burrowa	427	2,300	4,067	280,518	3,647	290,532
Camden (Camden)	350	2,422	8,865	5,638	1,495	18,420
„ (Campbelltown)	159	912	2,599	2,413	334	6,258
„ (Berrima)	616	3,229	18,471	15,724	3,528	40,952
„ (Picton)	277	1,553	7,849	2,782	2,126	14,310
Canterbury	785	1,686	1,589	281	1,876	5,432
„ Miscellaneous	.....	882	416	29	539	1,866
Carcoar	980	7,053	11,577	535,906	5,622	560,158
The Clarence	725	5,122	13,918	310	1,933	21,283
Central Cumberland	444	1,161	1,581	233	967	3,942
„ Miscellaneous	.....	223	70	.....	70	363
„ (Liverpool)	297	1,113	2,646	1,815	900	6,474
„ (Parramatta)	37	76	64	22	25	187
„ Miscellaneous	.....	375	189	6	.....	570
„ (Ryde)	368	729	632	140	728	2,229
Durham	704	5,075	25,043	2,383	7,051	39,552
Eden	1,070	5,603	42,871	2,223	11,932	62,629
Forbes	392	3,483	6,529	1,211,222	1,836	1,223,070
The Glebe	5	19	14	.....	8	41
„ Miscellaneous	.....	846	179	.....	3	1,028
Glen Innes	323	3,880	42,452	281,401	1,307	329,040
Gloucester	510	2,873	27,987	1,071	4,463	36,394
Goulburn	99	325	320	96	244	985
Grafton	756	5,447	32,399	2,818	2,530	43,194
Grenfell	479	3,940	7,656	1,233,641	1,855	1,247,092
Gundagai	570	5,428	15,580	611,762	3,740	636,510
Gunnedah	355	5,039	12,374	990,611	1,522	1,009,546
The Gwydir	575	10,779	60,063	1,135,466	1,325	1,207,633
Hartley	423	2,750	7,975	61,302	2,307	74,334
The Hastings and Manning	1,254	6,795	27,402	2,153	13,294	49,644
The Hawkesbury	790	4,245	6,472	3,055	4,013	17,785
The Hume	948	10,502	26,598	1,488,274	3,509	1,528,883
The Hunter	451	2,877	8,904	4,878	2,389	19,048

LIVE STOCK—*continued.*

Name of Electoral District.	No of Stockholders.	Description of Stock.				Totals.
		Horses.	Horned Cattle.	Sheep.	Pigs.	
		No.	No.	No.	No.	No.
The Upper Hunter	970	10,965	50,411	811,739	4,532	877,647
Illawarra	517	2,221	12,355	1,422	4,089	20,087
Inverell	459	4,283	16,162	253,461	1,681	275,587
Kiama	537	2,292	20,165	740	7,517	30,714
The Macleay	1,036	6,331	27,285	468	6,124	40,208
East Macquarie	568	3,847	8,242	143,682	2,170	157,941
West Macquarie	377	2,684	5,351	85,457	1,480	94,972
East Maitland	223	1,284	3,052	3,641	1,106	9,083
West Maitland	66	259	165	.....	147	571
Molong	766	5,450	7,478	327,114	4,020	344,062
Monaro	1,043	10,442	36,974	994,051	1,946	1,043,413
Morpeth	435	3,002	4,233	2,756	1,920	11,911
Mudgee	1,269	7,039	15,749	269,461	4,864	297,113
The Murray	644	6,332	8,842	1,854,312	1,683	1,871,169
The Murrumbidgee	1,422	14,525	23,955	3,835,457	5,628	3,879,565
The Namoi	403	4,540	12,649	908,815	1,386	927,390
The Nepean	466	2,737	5,920	8,552	1,804	19,013
Newcastle	34	463	723	50	386	1,622
New England	1,024	8,107	56,218	1,070,144	3,743	1,138,212
Newtown	26	136	255	5	4	400
„ Miscellaneous	.....	971	140	.....	.....	1,111
Northumberland	220	1,207	1,950	443	992	4,592
Orange	609	4,226	6,906	75,335	2,782	89,249
Paddington	175	440	574	9	130	1,153
„ Miscellaneous	.....	1,313	600	.....	2	1,915
Patrick's Plains	607	5,754	27,033	65,660	5,321	103,768
Queanbeyan	470	3,606	11,067	338,608	1,705	354,986
Redfern	230	806	513	.....	619	1,938
„ Miscellaneous	.....	2,145	567	3	559	3,274
The Richmond	1,739	11,014	136,488	1,506	4,468	153,476
Shoalhaven	1,046	5,077	35,971	2,203	12,428	55,679
St. Leonards	310	576	774	294	577	2,221
„ Miscellaneous	.....	398	132	3	68	601
East Sydney	.....	.....	.....	.....	.....	.....
„ Miscellaneous	.....	1,403	205	.....	.....	1,608
South Sydney	1	1	2	.....	.....	3
„ Miscellaneous	.....	1,106	74	1	.....	1,181
West Sydney	5	26	16	.....	.....	42
„ Miscellaneous	.....	1,952	133	65	1	2,151
Tamworth	717	7,288	16,623	521,697	3,557	549,165
Tenterfield	458	3,279	37,695	113,824	1,439	156,237
Tumut	584	4,516	20,234	319,068	3,090	346,908
Wellington	504	3,056	4,154	265,956	2,311	275,477
Wentworth	233	7,601	14,630	2,606,329	669	2,629,229
Wollombi	649	2,801	8,462	504	3,859	15,626
Yass Plains	648	4,975	10,146	499,745	3,000	517,866
Young	675	4,878	9,408	640,956	4,408	659,650
General Total	40,790	329,983	1,270,078	34,551,622	208,697	36,360,380

DECENNIAL RETURN of Live Stock in the Colony.

Year ended 31 March.	Horses.	Horned Cattle.	Sheep.	Pigs.	Year ended 31 March.	Horses.	Horned Cattle.	Sheep.	Pigs.
	No.	No.	No.	No.		No.	No.	No.	No.
1877	366,703	3,131,013	24,503,388	173,604	1882	346,931	2,180,896	33,062,854	213,916
1878	328,150	2,746,385	20,962,244	191,677	1883	328,026	1,859,985	31,796,308	154,815
1879	336,468	2,771,583	23,967,053	220,320	1884	326,964	1,646,753	34,418,488	189,050
1880	360,038	2,914,210	29,043,392	256,026	1885	330,603	1,336,329	30,379,871	211,656
1881	398,577	2,597,348	32,403,082	312,113	1886	329,983	1,270,078	34,551,622	208,697

AGRICULTURE.

ABSTRACT RETURN of AGRICULTURE for the Year ending 31st March, 1886, showing the Number of Holders of Land of 1 acre and upwards, the extent of Holdings, distinguishing Freeholds from Leaseholds (exclusive of lands leased from the Crown), together with the Acreage under the different kinds of Crops, and the Produce thereof in each Electoral District of the Colony.

Electoral District.	Number of Holders of Land exceeding 1 acre.	Extent of Land in cultivation.		Extent of Land enclosed but not in cultivation.		Extent of Land unenclosed.		Total Extent of Holdings.	
		Freehold.	Leasehold.	Freehold.	Leasehold.	Freehold.	Leasehold.	Freehold.	Leasehold.
		acres	acres	acres	acres	acres	acres	acres	acres
Albury	236	7745½	192¼	95754¾	8017¼	230	......	103730¼	8210
Argyle	1149	14674½	2954¼	609556	110575¼	24514¼	4553	648745¼	118083½
Balmain	26	16	......	148	38	......	......	164	38
Balranald	336	5309	201	3179500	123614	67753	164	3252562	123979
The Bogan	895	10211¼	850	1330906½	50080	249264	16758	1590381¾	67688
Bourke	268	49	4	220933	13326½	564916	180	785898	13510½
Braidwood	506	3776½	864¼	142357	28052½	20725½	1011	166859	29927¾
Burrowa	471	6658	924	237368	36543	52319	3721	296345	41188
Camden (Camden)	380	2718	4309	46265	43908	1276	..	50259	48217
„ (Berrima)	723	14342	6984	97951	38044	31401	4002	143694	49030
„ (Campbelltown)	167	1041	808	19698	8788	250	60	20989	9656
„ (Picton)	335	1524	1241	46159	26214	9590	596	57273	28051
Canterbury	991	1450¼	284	9372¾	3056	1904½	191	12727½	3531
Carcoar	1068	22022¼	2767½	392873½	60450¾	77176	63441	492071¾	126659¼
Clarence, The	773	13829¾	6597	56338¾	10154½	3322½	48	73191	16799½
Central Cumberland	529	5524	306½	28055½	5704½	863¾	200	34442¾	6211
„ „ (Parramatta)	45	57¼	31	179½	31	28½	11½	265¼	73½
„ „ (Ryde)	460	3496¼	231	12219¼	592½	4672½	70	20389	893½
„ „ (Liverpool)	368	1240½	689	24103	20302¼	14106½	436	39450	21427¼
Durham	677	4085¼	4493¼	173448¼	46157¾	5451½	4282¼	182985½	54933¼
Eden	1148	16698	2467	313148	57561	74209	7423	404055	67451
Forbes	405	6960	312	290188¼	4032	51561	1778½	348709¼	6122½
The Glebe	5	15	4	22	......	......	......	37	4
Glen Innes	388	7670	830	170880	3577	232965	146	411515	4553
Gloucester	556	2130	1784¼	81681¾	43750¼	108635	113139	192446¾	158674
Goulburn	117	388¾	254¼	2040¼	612¾	49½	81	2478½	948
Grafton	644	6207	4764	109930	24616	24733	216	140870	29596
Grenfell	514	7508½	......	819309¼	2543	145860½	....	972678¾	2543
Gundagai	604	20462	2810¾	623472¼	20691½	23975	2375	667909¼	25877¼
Gunnedah	373	5150	257	1285883	11269	97882	2877	1388915	14403
Gwydir, The	625	3367½	297½	858950	161191	297480½	20043¾	1159798	181532¼
Hartley	488	3050	1000¼	72437½	24151¾	25857¼	12841	101345¼	37993½
Hastings and Manning, The	1314	12045¼	6489	121191	20959¼	63621¼	35254	196858½	62702¼
Hawkesbury, The	806	9143¼	5109	55892	17995½	5515¼	166	70551	23270½
Hume, The	969	40125	2704	1677832½	138941½	45156½	1822	1763114	143467½
Hunter, The	512	3906	3393	49698	38748	1857	298	55461	42439
Hunter, The Upper	1074	9637½	974½	1188821½	63120½	217272½	22195	1415731½	86290
Illawarra	539	1255½	1543½	24196	29945	6273	3221	31724½	34709½
Inverell	478	11996½	800	149011¾	2410½	61637¼	2217	222646	5427½
Kiama	558	11674	15874	12697	18318	1210	500	25581	34692
Macleay, The	1179	12483	9851	95383	18268	40955	3037	148821	31156
Macquarie, East	590	10835½	18457¾	118016	50619½	18936	12173	147787½	81250¼
Macquarie, West	386	5771¼	12786¼	63323	45740¼	4234¼	634	73329½	59160½
Maitland, East	223	579¾	931½	11007¾	17409½	180	1975	11767½	20316
Maitland, West	74	406	500½	144½	44½	......	......	550½	545
Molong	838	27676¾	1616	369964½	25472	61369¼	9490	459010½	36578
Monaro	1099	11464	371	1003601	70610	108709	6945	1123774	77926
Morpeth	445	2857½	6653¼	13753	16877¼	... .	250	16610½	23781
Mudgee	1231	18588½	4889½	264618½	41407¼	41977½	11720	325184½	58016¾
Murray, The	536	24227	659	3090905	128171	35453	520	3150585	129350
Murrumbidgee, The	1647	35084¼	1314	5143648½	478143½	66027	780	5244759¾	480237½
Namoi, The	446	2640½	233	514331	8759	367606¼	3020	884577¾	12012
Nepean, The	571	2401½	3195¾	57510	38978½	11574½	738	71486	42912¼
Newcastle	34	32	49	768	2076¾	760	707	1560	2832¾
New England	1011	16607½	1549½	633038¾	33928½	212793½	7142	862439¼	42620
Newtown	31	9	12	154½	210½	......	......	163½	222½
Northumberland	230	526¼	540¼	12764	5644¾	17546¾	5714	30837	11899
Orange	627	22783¼	5127¼	112326	29367¾	18529¾	1287¾	153639½	35782¾
Paddington	225	193¼	146¾	1367½	162¼	651	10¾	2211¾	319¾
Patrick's Plains	661	4893	3186	326626	81193	10708	1018	342227	85397
Queanbeyan	502	7069¾	1485¾	396358¼	19973	20685¼	6127½	424113¾	27586¼
Redfern	259	298¾	467	4602½	367	610½	165	5511¾	999
Richmond, The	2005	27771	4315½	364366¼	15992¾	204534¾	5407	596672	25715¼
Shoalhaven	1212	38312	28049	83555	36203	24844	3984	146711	68236
St. Leonards	401	1764¼	153	5387	1338¾	8659¾	544½	15811½	2036¼
East Sydney	...	......	......	......	......	......	......	......	......
South Sydney	1	......	......	1	......	......	......	1	......
West Sydney	6	2	......	16	......	12	......	30	......
Tamworth	793	18517½	1916½	370780¼	10211	51429	17221	440726¾	29348½
Tenterfield	440	4951¼	158½	74868½	795	35658	485	115477¾	1438½
Tumut	634	5273¾	2551½	229097¾	17678½	34753¼	1537	269124¾	21767
Wellington	561	12848¾	1657	205510	6633	61573½	1879	279932¼	10169
Wentworth	212	1664	40	718248	4100	380141	684	1100053	4824
Wollombi	696	5445	2550	78883	19459	29876	11562	114204	33571
Yass Plains	694	11075¾	1287½	475438	26978	24951½	5548	511465¼	33813½
Young	707	27598¾	3177½	650578¾	20206½	39614½	2620	717792	26004
General Total	43727	661814¾	206278½	30121411	2591104	4550871¼	451243½	35334097	3248626

Crops.

Electoral District.	Wheat.		Maize.		Barley.			Oats.			Rye.		Millet.	
	For Grain.	For Hay.	For Grain.	For Green Food for Cattle.	For Grain.	For Hay.	For Green Food for Cattle.	For Grain.	For Hay.	For Green Food for Cattle.	For Grain.	For Green Food for Cattle.	For Grain.	For Green Food for Cattle.
	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres
Albury	5172¼	1017½	30	...	84	35	5¼	198	595¾	...	1½	...	...	...
Argyle	5661¼	1374	285¼	39½	134¼	99½	41½	488	6560½	165½	25½	24	...	...
Balmain	......	......	......	...	...	...	2	...	...	..	...	...	...	...
Balranald	100	5134	...	34	...	41	...	...	161	.	...	...	...	...
The Bogan	2446¼	6254¾	195½	66½	15	2	27	4	691	28	6½	...	...	2
Bourke	... ..	......	...	...	...	...	..	...	...	...	...	...	...	...
Braidwood	1204½	1038¾	242½	3¼	32½	27	9½	157	1106¾	167	5	3	...	...
Burrowa	5003	317	92	65	132	47	28	128	1128	12	6	...	...	23
Camden (Camden)	50	1309	193	88	38	83	242	26	4034	145	11	41	..	7
„ (Berrima)	20	8	6	786	12	33	16	33	1551	276	17	21	...	...
„ (Campbelltown)	3	76	...	51	2	37	33	1	1507	11	4	12	...	...
„ (Picton)	40	34	535	19	14	1	56	6	1629	22	45	13	.	...
Canterbury	......	7	6	12¾	..	...	6½	.	20	20	...	¼	...	1
Carcoar	12252¾	3340	626¼	72	204¼	81	7½	1663½	4997	4½	40¼	4½	...	...
Clarence, The	......	......	14212½	17	1	...	9	2	26½	15	...	...	...	...
Central Cumberland	......	32	4	27½	..	26½	57	..	415½	91¼	...	...	...	3
„ „ (Parramatta)	......	¾	......	..	...	...	...	...	...	...	...	...	...	...
„ „ (Ryde)	... ..	......	9	9	4	...	...	...	109½	28½	...	...	..	...
„ „ (Liverpool)	3	22	3	12½	...	8½	19	30	846¼	176	2	1	..	1¼
Durham	305	24	5894	29¼	230½	20	271¾	61½	187½	32	12	...	...	2
Eden	80	61	5335	296	16	30	106	60	1212	321	...	196	...	1
Forbes	3430	3277¼	94	8	6	12	2	12	205½	...	...	4	...	...
The Glebe	......	......	......	...	...	...	...	...	...	...	...	...	...	...
Glen Innes	2112	538	1295	13	109	103	16	1254	2083	21	5	132	...	...
Gloucester	202½	2	2511	14	32¼	1	130½	8	182	45¼	6	3	18½	89½
Goulburn	......	46¼	8	1	2	8	15½	...	212	13	2½	...	..	...
Grafton	......	3	9850	55	31	4	22	2	115	20	...	...	...	2
Grenfell	4345	2187½	165	13	35	2	7	225	381½	...	2	...	...	...
Gundagai	18438¼	2069	219	...	109½	16	10	142	1656½	13	3	...	.	...
Gunnedah	2332	1815	52	163	4	15	86	...	344	103	3	1	...	...
Gwydir, The	983½	1634	466	59	5	57	21½	..	252½	15	22	...	...	13
Hartley	405	268	93¼	2	14½	21	6½	496½	1826	21½	53¾	3	...	...
Hastings and Manning, The	63	14	17489½	8½	74½	10	89½	28	169½	32½	...	1	...	..
Hawkesbury, The	19½	593	6007½	57¼	34	32½	285¾	8	1310¼	64½	66½	69¾	...	22½
Hume, The	30217¼	5104¼	22	5½	431½	77	8¼	2122½	3272¾	11	14	32½	...	...
Hunter, The	36	197	1730	38	221	6	273	71	449	37	3	9	7	7
Hunter, The Upper	4938	1655½	155	93	637	55½	172½	33½	722	151½	...	4	...	...
Illawarra	......	......	207½	266	3	...	136½	2	214½	244	3	9½	..	4
Inverell	3982¼	1260	3182½	19	64	11	42	152½	2762	13	9	14¼	...	...
Kiama	.....	......	161	411	13	..	47	43	147	275	23	9	...	...
Macleay, The	... ..	......	21261	4	38	1	21	1	41	24	...	2	...	...
Macquarie, East	7543½	7216½	536½	10	58	341	74½	888½	11510	205½	25	5	...	...
Macquarie, West	5314½	4610	346¼	8	56½	15	10	188½	6919¾	140	5½	...	...	...
Maitland, East	......	7	379	2	11	...	44	39	138	3½	..	...	2	8
Maitland, West	......	... ..	75	2	...	...	34	...	4	...	...	.	...	...
Molong	20337	3868½	832	180½	58½	6	24	304½	1837½	126	10½	4½	.	...
Monaro	2868	2216	20	3	106	103	16	855	4118	30	14	9	...	40
Morpeth	......	15	1974	8	65¼	44	245¼	...	299½	17	16	12	196	16½
Mudgee	10125	3290¾	2633¼	286	181	91¼	120¼	304¼	1199¾	25	11¼	22	...	1½
Murray, The	14707	9432	.....	8	154	2	3	20	118	...	6	...	...	...
Murrumbidgee, The	19793½	12979½	16¼	13	245	19	13	176	1797	29¼	1	10	...	4
Namoi, The	799	1280	219	64¼	19	...	14¾	2½	73	3	1	...	...	6
Nepean, The	32	320½	1175	62¼	31	73	88¼	5	2402	74½	13½	36½	...	9
Newcastle	......	......	8	...	...	...	1	...	...	2	...	...	...	5
New England	6201½	2287	1406½	39½	49¾	101½	28¾	722½	4485¼	101	17½	47	...	15
Newtown	......	......	......	6	...	...	...	...	...	...	...	...	...	...
Northumberland	......	......	157¾	23	...	...	16½	...	53½	34½	...	...	...	2
Orange	12974½	2845	228½	30½	46	55½	8¼	1133¼	6936	26¼	46	½	32	½
Paddington	......	......	......	¼	...	...	4¼	...	¼	3½	...	...	...	...
Patrick's Plains	1220	1245	2063	74	321	53	330	20	150	19	28	4	...	2
Queanbeyan	3000	883	260½	3½	56¼	81	28½	468½	3109¼	97	23½	20	...	...
Redfern	......	......	......	1	...	...	2	...	...	...	...	1	...	...
Richmond, The	5	2½	9617	309½	46¾	2	62¾	2	184½	48	14	86	½	4
Shoalhaven	61	11	6007	365	64	37	150	103	896	749	14	88	...	7
St. Leonards	......	......	4	12½	...	8½	1½	...	33½	2¾	...	...	...	...
East Sydney	......	......	......	...	...	...	...	...	...	...	...	...	...	...
South Sydney	......	......	......	...	...	...	...	...	...	...	...	...	...	...
West Sydney	......	......	......	½	...	½	¼	...	¼	½	...	...	...	...
Tamworth	12838	2769¾	1531	111	294¾	7	90¼	13	660½	61	7¼	7	4¼	96½
Tenterfield	2146¼	324	1258	20	4½	12½	5½	63	790½	23½	4	3¼	...	...
Tumut	2184¾	39	2550	3½	29¼	11	2½	320	803½	3	5	.	5	...
Wellington	8707½	3182	280½	62½	20	55	76	20	687	62	2	...	1	10
Wentworth	120	1484	... ..	...	...	...	...	...	25	...	...	...	...	..
Wollombi	763	56	5478	17	87	4	114	228	301	29	...	2	...	6
Yass Plains	7698	509½	300¼	31	168½	166	13	345½	2153½	136	7	10	...	...
Young	21581¾	3534	712¼	168	340½	22	51	436	2135¾	78	2½	10	...	...
General Total	264867	105122	132709	4784¾	5297¾	2314¼	4004	14117	96945¼	4748¼	666	988	266¼	411¼

Crops (continued).

Electoral District.	Potatoes.	Tobacco.	Sorghum & Imphee.		Sugar-cane.		Arrowroot.	Sown Grasses.		Vineyards.	Orangeries.	Gardens and Orchards.	All other in Crop.	Total number of Acres under Crop.
			For Grain.	For Green Food for Cattle.	Productive.	Unproductive.		For Hay.	For Green Food for Cattle.					
	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	
Albury	14¼	9½	...	1	...	...	...	...	30	621½	3	107¾	11	7937¾
Argyle	1460¾	23½	...	4	...	...	...	58	320½	13½	½	806¾	42½	17629¼
Balmain	2	...	...	...	...	...	...	...	2	...	...	10	.	16
Balranald	. . ..	...	...	...	...	...	...	...	6	4	...	15	15	5510
The Bogan	101½	...	2	1	...	...	...	18½	257	83½	...	243¼	616	11061¼
Bourke	...	...	...	...	...	...	...	...	.	...	...	3	50	53
Braidwood	306½	24	...	...	...	...	...	16	28	11¼	2	210¾	45	4640¼
Burrowa	172	...	3	4	...	..	...	18	273	15	...	116	.	7582
Camden (Camden)	15	...	3	52	...	3	...	63	298	78	1	183	64	7027
„ (Berrima)	523	3	...	17	...	...	...	8	17362	8	1	616	9	21326
„ (Campbelltown)	6	...	...	13	...	..	...	2	8	23	...	58	2	1849
„ (Picton)	27	...	1	7	...	6	..	18	4	26	...	143	119	2765
Canterbury	141	½	...	17½	...	..	...	...	7	25½	46½	1051¼	371	1734¼
Carcoar	785¾	37¾	½	.	...	..	...	74	186	12	14½	245½	140¼	24789¼
Clarence, The	81	3	5	13	3747¼	2145¼	..	17	45	½	6½	53	26¼	20426¾
Central Cumberland	8¾	...	...	13½	...	..	...	. .	131	158¾	3177½	1504	180¼	5830½
„ „ (Parramatta)	......	...	...	1¾	...	..	...	...	2	3	10	66¾	4	88¼
„ „ (Ryde)	3	...	...	2	...	..	...	.	5¼	213½	1290½	2031½	22	3727¼
„ „ (Liverpool)	22¼	...	...	20½	...	..	...	16	27½	118¼	37	379	184½	1929½
Durham	131¾	20½	½	22¾	...	..	...	242½	236½	229½	157¾	315½	151¼	8578½
Eden	595	7	...	147	...	..	...	22	10045	26	5	488	116	19165
Forbes	31½	...	1	9½	...	..	...	. .	23	20¼	6	105½	24½	7272
The Glebe	......	...	...	2	...	..	...	...	...	...	...	7	10	19
Glen Innes	444	14	...	..	...	..	...	25	231	17	...	86	2	8500
Gloucester	87¼	2¼	..	46¼	...	..	...	28½	226	48½	27	162¼	39¼	3914¼
Goulburn	17¼	...	..	2½	...	...	...	18	34¼	4	...	244¾	13	643
Grafton	220	...	5	15	159	144	...	61	165	47	...	50	1	10971
Grenfell	19½	1	...	...	...	...	...	..	43	2¼	...	72¾	7	7508½
Gundagai	59	64	...	...	...	...	...	49	38½	20¼	1	189	175¾	23272¾
Gunnedah	26	...	2	...	...	...	...	52	225	2	...	117	65	5407
Gwydir, The	40½	...	..	3	...	..	...	15	34	3	. .	19	22	3665
Hartley	560¼	12¼	6	...	...	...	...	4	12½	...	6	226¼	12	4050¼
Hastings and Manning, The	103	2½	...	18¼	7	5	...	15	123¼	172	6½	94¼	7½	18534¼
Hawkesbury, The	88¼	4	...	49¾	1	2	...	1323½	1057½	114	1768	661¾	611	14252¼
Hume, The	135½	32½	...	1¼	...	..	...	11	351½	569¼	13¾	268	126¼	42829
Hunter, The	518	8	...	36	...	1	15	1891	418	906	...	242	180	7299
Hunter, The Upper	46¼	3¾	...	26	...	...	.	493	794½	150¾	35	224¾	220½	10612
Illawarra	72	...	4	1033¾	...	14	...	15	331½	10½	...	202	26¼	2799
Inverell	126	1	...	4	...	...	...	339¾	335½	221½	1	231½	21¾	12796½
Kiama	88	1	..	1140	...	...	...	17	25089	...	...	83	1	27548
Macleay, The	79	5	...	...	54	127	...	13	497	22	3	118	23	22334
Macquarie, East	340¾	71¼	...	...	...	...	...	116	92	16	3	159¾	80½	29293¼
Macquarie, West	211½	39	...	...	..	...	...	183	171½	3½	...	115	220	18558
Maitland, East	72	...	...	29	...	...	...	521	157½	12¾	7	36	42½	1511¼
Maitland, West	29½	1	...	1	...	...	...	242	395	12	3½	78¾	28½	906½
Molong	268	5¼	...	..	...	...	...	18	486	13	2	211¼	700	29292¾
Monaro	616	36	...	...	...	...	...	376	187	1	...	156	65	11835
Morpeth	219	11	3	106¾	4	...	...	5911	140¼	68½	10	63¼	65	9511¼
Mudgee	473¼	28½	...	15	...	...	..	818½	3198¾	143½	2½	439	67¼	23478
Murray, The	13	...	...	1	...	...	...	...	311	8	..	95	8	24886
Murrumbidgee, The	116¼	411	...	47	...	...	...	...	28	108¼	.	190	399¼	36398¼
Namoi, The	59½	2	...	...	...	...	...	51	86	17¼	3	72	101¼	2873½
Nepean, The	12¼	...	...	42	6	2½	...	100	113	140½	140	418	300	5597¼
Newcastle	1	...	...	6	...	...	...	...	7	...	..	47	4	81
New England	863	16	...	1	...	...	...	31	1024	16½	½	560	142¼	18157
Newtown	......	...	...	...	...	...	...	...	...	...	...	15	...	21
Northumberland	39	...	...	73	...	...	...	52	167½	53	14½	351½	28¾	1066½
Orange	2386½	7	...	...	...	...	...	162	494	10¼	...	353½	134½	27911
Paddington	15¾	...	...	¼	1½	...	...	..	4½	...	...	269¼	40½	340
Patrick's Plains	135	23	4	12	...	...	...	886	586	341	21	217	325	8079
Queanbeyan	217	1½	...	..	...	...	...	...	172	5½	3	90¼	35	8355½
Redfern	150½	1	...	...	...	...	...	...	...	...	...	36¼	574	765¾
Richmond, The	138½	5¼	...	82½	5603	4206½	2	22½	11054	12¼	34½	409¼	131¼	32086½
Shoalhaven	416	8	9	792	...	179	50	157	55920	8	1	229	40	66361
St. Leonards	¼	...	...	6	...	...	...	...	17	31¾	818¾	975¼	6	1917¾
East Sydney	......	...	...	...	...	...	...	...	...	...	...	...	...	...
South Sydney	......	...	...	...	...	...	...	...	...	...	...	...	...	...
West Sydney	......	...	...	...	...	...	...	...	...	...	.	...	...	2
Tamworth	119¼	2¾	...	7	...	.	..	566½	441	45	½	256¼	504½	20434
Tenterfield	220½	2½	1	...	...	.	...	27	42	4¼	½	139½	16½	5109¼
Tumut	260¼	638½	...	7½	...	...	...	20	715	27¼	...	151	48¾	7825¼
Wellington	65¼	...	1	5½	...	...	...	140	925	42¾	1	120¾	39	14505¼
Wentworth	......	...	...	...	...	...	...	...	41	...	...	33	1	1704
Wollombi	110	2	...	8	...	...	1	2	120	17	47	549	54	7995
Yass Plains	362¾	10	...	...	...	...	...	83	203	15½	...	123¼	27½	12363¼
Young	74¼	...	...	8	...	...	...	75	1194¾	71	¼	229½	51¼	30776¼
General Total	15166	1603	51	3974¾	9583¼	6835¾	68	15504¼	137798½	5247¼	7733¾	19245¼	8040¾	868093¼

Produce.

Electoral District.	Wheat.	Maize.	Barley.	Oats.	Rye.	Millet.	Potatoes.	Tobacco.	Sorghum and Imphee (Grain).	Sugar-cane grown.	Sugar produced at the Mills.	Arrowroot.
	bushels	bushels	bushels	bushels	bushels	bhls.	tons	cwt.	cwt.	cwt.	cwt.	lb.
Albury	47716½	...	1377	3554	14	...	22¼	59½	...	......	...	...
Argyle	53942	7460	1871	6596	259	...	3699¼	1060	...	......	...	...
Balmain	.	...	...	...	...	...	4	...	...	......	...	...
Balranald	950	...	...	...	...	...	...	...	...	......	...	...
The Bogan	15018½	1489	162¼	40	20	...	62¾	...	20	......	...	...
Bourke	.	...	..	..	..	...	...	...	...	... ..	...	...
Braidwood	14682	5132	592	3210	65	...	915½	526	...	......	...	...
Burrowa	52650	1185	2300	2049	67	...	252	...	20	......	...	.
Camden (Camden)	356	4449	697	242	83	...	18	...	80	.. ..	...	...
„ (Berrima)	339	135	187	759	112	...	1717	4	...	......	...	...
„ (Campbelltown)	40	...	22	10	27	...	10	...	...	......	...	...
„ (Picton)	370	16475	257	80	467	...	39	...	10	. .	..	
Canterbury	...	50	...	...	...	...	841¾	80	...	......	...	...
Carcoar	121496	8459	2577	27653	435	...	1835	700	...	......	...	.
Clarence, The	...	478521	20	6	..	...	192½	42	160	1686400	192083	...
Central Cumberland	...	90	...	...	...	...	24¾	...	...	......	...	. .
„ „ (Parramatta)	...	...	...	...	...	...	...	...	...	......	...	. .
„ „ (Ryde)	...	290	10	...	...	...	4½	...	...	......	...	..
„ „ (Liverpool)	15	20	...	14	...	...	56	...	...	...	...	...
Durham	3819	183989	6535	1383	310	...	253½	297½	½	... ..	...	...
Eden	1716	202856	250	1219	...	...	1604	323	...	... ..	...	...
Forbes	17089	1090	60	...	...	...	32	...	...	......	...	...
The Glebe	...	...	...	...	...	...	...	...	...	......	...	...
Glen Innes	44878	36007	2990	45691	80	...	1763	840	...	......	...	..
Gloucester	38727	74804	616	160	140	526½	193¼	13	...	......	...	...
Goulburn	...	250	20	...	8	...	44½	...	...	......	...	...
Grafton	...	309011	630	20	...	...	299	...	...	2747	824	..
Grenfell	45037	3455	443	3019	20	. .	30	40	...	......	. .	...
Gundagai	210578	4347	1186	2724	20	...	66¼	660	...	......	...	...
Gunnedah	17474	253	60	...	...	...	31	...	...	......	...	...
Gwydir, The	10674	6336	45	...	34	...	36	...	...	......	...	...
Hartley	4621	1654	195	8152	700	...	1594	27	...	......	...	...
Hastings and Manning, The	820	593882	1445	659	..	...	232	100	...	2162	50	...
Hawkesbury, The	159	241241	1292	170	1036	...	202¾	42	...	20	...	...
Hume, The	323855	630	8196	46542½	153	...	451½	610	...	......	...	...
Hunter, The	352	42737	4528	1120	32	156	1067	320	...	......	..	20
Hunter, The Upper	34994	2368	7925	344	...	...	86	50	...	......	...	...
Illawarra	...	4244	111	...	53	...	120	...	1½	......	...	...
Inverell	77623	71252	1039	2996	187	...	308	80	...	......	...	...
Kiama	...	5454	276	915	405	...	335	20	...	......	...	...
Macleay, The	...	919112	540	...	...	..	237	9	...	765	1780	...
Macquarie, East	68874	12015	1132	14494	263	. .	1124½	920	...	......	...	...
Macquarie, West	37022	6707	453	3709	70	...	573¼	547	...	......	...	...
Maitland, East	...	13381	156	980	...	30	93¾	...	...	......	...	...
Maitland, West	...	1901	...	...	...	...	116	16	...	......	...	...
Molong	137195	8615	510	2658	64	...	586¾	29	...	......	...	...
Monaro	30560	105	1668	17413	345	...	1352	115	...	......	...	...
Morpeth	...	74312	1682	...	320	2808	553¾	640	86	......	...	...
Mudgee	63874	59901	2863	3603	67		1218¾	886	...	......	...	...
Murray, The	235457	...	2427	400	79	...	25	...	...	......	...	...
Murrumbidgee, The	159058½	187	1854	3098	8	.	220¼	4070½	...	......	..	...
Namoi, The	7776	3415	234	13	.	...	66	40	...	......	...	...
Nepean, The	460	34220	792	70	38	...	20¾	...	...	400	...	...
Newcastle	...	257	...	...	...	...	3	...	...	......	...	...
New England	95461	28320	1116	21962	239	...	2869½	1115	...	......	...	...
Newtown	...	...	...	...	...	...	...	...	...	......	...	...
Northumberland	...	3660	...	...	...	...	79	...	...	......	...	...
Orange	171400	3180	930	18884	80	74	4962½	300	...	......	...	...
Paddington	...	...	...	...	...	...	140	...	...	... ..	...	...
Patrick's Plains	15249	47108	4328	250	368	...	237	18	107	......	..	...
Queanbeyan	35955	6390	1323	7663	358	...	607¼	60	...	......	...	...
Redfern	...	...	...	...	...	...	1143	8	...	... ..	...	...
Richmond, The	150	288060	1400	50	80	5	331¾	44	...	2927725	174543	3000
Shoalhaven	722	179820	1283	1962	314	...	1287	7	600	......	...	...
St. Leonards	...	45	...	...	...	...	¼	...	...	......	...	...
East Sydney	...	...	...	...	...	...	...	...	...	......	...	...
South Sydney	...	...	...	...	...	...	...	...	...	......	...	...
West Sydney	...	...	...	...	...	...	...	...	...	......	...	...
Tamworth	130601	27639	3795	380	103	58	258½	62	...	......	...	...
Tenterfield	36396	30856	79	1117	38	...	442½	100	...	......	...	..
Tumut	31120	113655	825	7395	113	150	646½	7605	...	......	...	...
Wellington	56218	2734	214	...	14	40	77	...	60	......	...	...
Wentworth	257	...	...	...	...	...	...	...	...	......	...	...
Wollombi	10706	149880	1837	3871	..	...	222	2	...	......	...	50
Yass Plains	88822	6815	3005	4776½	148	...	665	460	...	......	...	...
Young	215092½	4258	3246	5031	10	...	91	...	...	......	...	...
General Total	2768330	4235163	856061¼	279107	7846	6685½	38695	22947½	1145	4620219	369280	3070

Produce (continued) — Hay; Vineyards; Oranges.

Electoral District.	Hay. Wheat.	Hay. Barley.	Hay. Oats.	Hay. Sown Grasses.	Wine-making. No. of Acres.	Wine-making. Wine produced.	Wine-making. Brandy manufactured.	Table use. No. of Acres.	Table use. Quantity obtained.	Vines unproductive.	Oranges. Fruit obtained.
	tons	tons	tons	tons		gallons	gallons		tons	acres	No of doz
Albury	1064½	107	793	...	541¼	100539	90	31½	22¾	48¾	2100
Argyle	703	29	3556	40½	3	450	15	5¼	5½	5¼	......
Balmain	...	...	......	...	...	......	...	...	...	...	......
Balranald	3129	10	136	...	...	......	...	...	...	4	.... .
The Bogan	2240	...	393	10	44	4500	...	28¼	14¼	11¼	. . .
Bourke	...	...	......	...	...	.. ...	...	...	...	...	......
Braidwood	803	46½	921¾	28	8	100	...	3½	...	¼	17126
Burrowa	298	45	1034	4	13	2700	...	...	...	2	......
Camden (Camden)	810	5	1683	70	13	2450	...	56	73	9	......
„ (Berrima)	15	...	1597	...	8	950	...	..	4	...	......
„ (Campbelltown)	73	6	808	9	16	3500	25	...	...	7	......
„ (Picton)	35	1	523	4		50	...	3	2	23	... .
Canterbury	8	...	34½		2	400	...	19½	4	4	11900
Carcoar	1926	67½	3329½	34	...	. ...	..	12	8	...	
Clarence, The	..	...	44	156	...	...	...	½	1	...	13644
Central Cumberland	37½	23	288	...	4¾	540		132¾	124	21¼	6049443
„ „ (Parramatta)	2	...	... ..	...	...	... ..	...	3	4	...	1900
„ „ (Ryde)	...	. .	109	...	...	......	...	202½	213	11	1327513
„ „ (Liverpool)	19	3	479¼	9	1	300	...	74	146	43¼	9740
Durham	25½	15	231½	828½	177	43980	...	19¾	12½	32¾	178670
Eden	64	24	1259	32	...	......	...	15	14	11	......
Forbes	1430½	6½	62	.	3	560	...	16¼	24¾	1	......
The Glebe	...	...	......	...	...	......	...	...	...	...	......
Glen Innes	703	97	3530	44	16	3100	.	1	1	.	.. ...
Gloucester	5	2	246½	176	29	3900	20	14½	8	5	31600
Goulburn	20	4	87¼	10½	.	......		4	3	...	......
Grafton	3	10	184	182	24	5990	..	16	265	7	......
Grenfell	1126½	4	318	...	...	.... .	...	2¼	...	...	......
Gundagai	1563	15½	1606½	69	15½	3800	...	2¼	8½	2	......
Gunnedah	1525	17	162	70	...	.. ...	.	2	4	...	......
Gwydir, The	849¾	5½	205½	26	...	......	...	1	1	2	......
Hartley	217	14	1341	3	...	......	..	...	...	...	......
Hastings and Manning, The	2½	20	214	49	106½	20090	50	21½	17¼	44	1514
Hawkesbury, The	768¾	33½	1406½	2924	10½	1430	...	77¼	42½	25¼	1059351
Hume, The	5160	67	3531¼	9½	379½	38527	...	74¼	79	115½	1400
Hunter, The	232	11	525	4766	599	170109	1619	99	105	208	......
Hunter, The Upper	2156	46	522	543½	92½	16596	81	17¼	8¼	41	5000
Illawarra	...	...	183½	7	3	300	...	5½	5	2	......
Inverell	1292½	11	2490½	293½	171½	43280	1395	25	33	25	5000
Kiama	...	...	221	21	...	......	...	...	...	...	......
Macleay, The	...	3	63	54	14	2010	...	4	7	4	1700
Macquarie, East	3197½	151½	5804	169	6	2500	...	...	...	10	200
Macquarie, West	1879	11½	3093½	222	...	... ..	...	½	4	3	......
Maitland, East	19	...	232	1820	...	......	...	12½	10	¼	4050
Maitland, West	...	...	4	877	...	......	...	12	43	...	......
Molong	1427¼	6	978¾	19	8½	700	...	3	1	1½	......
Monaro	1061	65	3069	783	...	... ..	...	1	1	...	... .
Morpeth	36	73	503	24009	36	8500	97	19½	20½	13	7019
Mudgee	1499½	35	738¾	873	52	6690	..	42	77	49½	70
Murray, The	12575	4	295	...	...	......	...	8	11	...	......
Murrumbidgee, The	9665	18	1276½	. .	66½	15310	...	38¾	50¼	3½	......
Namoi, The	842½	...	3	27	3¼	360	. .	9	13	5	......
Nepean, The	286	27	1439½	88	78¾	4093	158	47¾	71½	14	85210
Newcastle	...	...	......	...	...	......	...	...	...	...	......
New England	2067¾	148	4840¾	56	2	......	...	14	...	½	......
Newtown	...	...	......	...	...	......	...	...	...	...	......
Northumberland	...	...	71	166½	9	500	...	38½	34¾	5½	27000
Orange	2187½	55	5037	95	3½	550	...	6¾	11	...	... ..
Paddington	...	...	1½	...	...	... ..	...	...	...	...	......
Patrick's Plains	1433	60	202	1165	227	37288	102	83	187	31	42900
Queanbeyan	555	53	2337	...	...	......	..	5½	...	...	......
Redfern	...	...	......	...	...	......	...	...	...	...	... ..
Richmond, The	2	½	237½	32	1	......	...	8¾	6	2½	6150
Shoalhaven	8	90	1554	130	...	......	...	3	1	5	400
St. Leonards	...	12	44	...	...	......	...	15¼	17	16	804656
East Sydney	...	...	......	...	...	......	...	...	...	...	......
South Sydney	...	...	......	...	...	......	...	...	...	...	......
West Sydney	...	...	......	...	...	......	...	...	...	...	......
Tamworth	2342¼	7	440½	1131	9½	1628	...	17½	21	18	5000
Tenterfield	611	12	1041½	82	...	......	...	2¼	1¾	1½	......
Tumut	37½	8	1075	14	9½	2200	...	12¾	13¾	5	......
Wellington	1029½	18	362½	139	27	1500	50	8¼	5¼	7½	......
Wentworth	438	...	30	...	...	......	...	...	...	...	......
Wollombi	25	4	420	4	3	500	189	8	7	6	49000
Yass Plains	368	128	1710¼	84	...	... ..	...	13½	8½	2	......
Young	2637¼	14	1523	74	39	3000	...	20½	18	11½	......
General Total	74606½	1749½	72484	42532½	2876½	555470	3893	1443	1695	927¾	8749256

DECENNIAL RETURN showing the Quantity of Land under Crop, and the Produce of the same, &c., in the Colony.

Year ended 31 March.	Crops.																		Produce.																
	Wheat.	Maize.	Barley.	Oats.	Rye.	Millet.	Potatoes.	Tobacco.	Arrowroot.	Sorghum and Imphee.	Sugar-cane.		Sown Grasses, Oats, Wheat, and Barley for Hay.	Vines.	Sown Grasses, Oats, Barley, Sorghum, &c., &c., for Green Food for Cattle.	Gardens and Orchards.	Orangeries.	All other in Crop.	Total Number of Acres in Crop.	Wheat.	Maize	Barley.	Oats.	Rye.	Millet.	Potatoes.	Tobacco	Arrowroot.	Sorghum and Imphee (Grain).	Sugar	Wheat, Barley, Oats, and Sown Grasses for Hay.	Vines.			Oranges.
											Productive.	Unproductive																			Wine	Brandy.	Fruit for Table use	
	acres	acres	acres	acres	acres	acres	acres	acres	acs	acrs	acres	acres	acres	acres	acres	acres	acrs	acres		bush.	bush.	bush.	bush.	bush.	bush.	tons	cwt.	lbs.	cwt.	lbs.	tons	galls	galls.	tons	No. of doz.
1877	145608¾	116364½	5662	21828½	1277	242½	14171½	333	53½	51½	3524	32313¾	111946	4457	61516½	20453	..	3119½	513840	2301979	3879537	134158	461916	22277	4400	42933¾	2440	86458	1290	10523520	159660¾	799709	2963½	917¾	....
1878	176686¾	105510	5055	18580½	1168½	230½	13862½	390	51¾	57½	3331½	37351½	125778	4183¾	65072¾	19000½	..	2043	546556	2445507	3551800	99485	358858	19184	3877	34957½	3049	83554	2745	10383823	154076	708431	1481½	797½	....
1879	233252½	130582½	6152	22129	1302	254¾	16724¾	835	27½	47½	2949¾	44891¼	1040953¾	4237½	69249½	18017¾	4287	40083¾	613642½	3439320	4420580	132072	447912	22563	5023	53590	7982½	47484	1735	18278736	172406½	684733	2540	1102	3398445
1880	233368½	135034	6130½	23983¼	1016½	86	19271	502	25¾	25¾	3676½	41023¾	1124133¾	4266½	64643¾	18130½	5106	3870½	635041	3613266	4701850	131541	510937	16373	1855	62227⅝	6221½	38531	305	17220296	162763½	738570	4186½	1017½	2763811
1881	253187¾	127196	8056	17922½	1095¾	211½	19095½	1791¼	37	65½	4465½	65061½	1311523½	4800½	102340½	18626	5939½	7693½	710337¼	3717355	4518897	163395	356121	16814	5080	52111⅝	10469½	33865	840	16352836	174195	602007	6628	1570½	3810356
1882	221887½	117478½	6420¾	16347¾	889½	200½	15943½	1025	126¾	29½	4083¾	71841½	1406101¼	4027¾	75825½	15541¼	6301¼	3633¼	645068	3405966	4080950	135218¼	356506	14677½	2519	44328	18311½	14412	2035	17813376	198531¾	513088¼	8522	1102¾	5164134
1883	247361	118180	6473½	24317¾	1031½	200½	14402½	1815	13¾	37	6362¼	71763½	179567	4448	92606½	17090¾	6716¾	5253¾	733582½	4042395	4057635	133050	617465	17380½	3066½	43460½	17540½	16034	6273⅛	11650088	242921½	543590	1614	1440½	4978829
1884	289757	123634½	5081	17810½	1140½	284¾	14953¾	1785¾	9¼	64	7683	74013½	1755031¼	4378½	101983¾	17465	7228¾	3082¾	780982½	4345487	4638004	106496	376036	16274	4078½	36076¾	20006½	6090	10141½	35220640	229242½	589604	4162	1377¾	3102658
1885	276249½	115600½	7035½	19472½	1110½	118½	12417½	1046	12½	41	6997	105201½	2266461¼	4684	140328½	20410½	6911¼	3309	852017	4203394	2989585	148809	425920	16739	1843	31334¾	9914½	1027	187	21835072	280311¾	441612	1432	1465½	4097666
1886	204807	132709	5207¾	14117	666	266½	15166	1603	68	51	9583¼	68363½	2198861¼	6247½	150710	19245¼	7733½	8040¾	868093¼	2768830	4235163	85606½	279107	7846	6085½	38695	22047½	3070	1145	41359360	191378½	555470	3893	1695	8749256

Number of Occupiers of Land, with Extent of Holdings, &c., &c.

Year ended 31 March.	Number of Occupiers of Land (excluding those for Pastoral purposes)	Total Extent of Holdings.	Extent of Land in Cultivation	Extent of Land enclosed but not in Cultivation.	Extent of Land unenclosed
		acres	acres	acres	acres
1877	39,639	18,210,796½	513,840	11,020,968½	6,675,987¾
1878	40,329	19,435,896¼	546,556	13,792,620½	5,096,720
1879	37,887	21,471,596	613,642¼	15,903,803½	4,954,150¼
1880	39,918	22,721,608½	635,641	17,578,339	4,507,573¾
1881	40,302	27,873,405¾	710,337¼	21,437,914¼	5,725,247½
1882	30,354	27,092,208¾	645,068	21,998,485	5,048,655¾
1883	39,760	30,714,349¾	733,582¾	24,977,047¾	5,003,719½
1884	40,793	33,862,993	789,082¼	27,241,009½	5,322,906¼
1885	43,078	35,035,504	852,017	29,810,775½	4,863,711¾
1886	43,727	38,682,723	868,093¼	32,712,515	5,002,114¾

Sydney: Thomas Richards, Government Printer.—1886.

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

EXPORT OF WOOL.

(RETURN OF—FROM 1880 TO 1886 INCLUSIVE.)

Ordered by the Legislative Assembly to be printed, 15 *June*, 1886.

[*Return, in answer to Question asked by Dr. Ross on 11th June.*]

SHOWING the number of pounds of Wool, also the number of bales of Wool, that were exported from New South Wales in the following years, viz., 1880–1–2–3–4–5 and 6 respectively; also the approximate value of the same.

NUMBER of pounds and value of Wool exported from New South Wales during each year from 1880 to 1886 inclusive.

	Weight.	Value.
		£
1880	162,486,322 lbs.	8,437,534
1881	147,183,687 lbs.	7,530,792
1882	153,351,344 lbs.	7,773,704
1883	199,638,895 lbs.	10,136,244
1884	183,016,518 lbs.	9,382,499
1885	178,373,425 lbs.	7,678,247
1886—to 31st March ...	43,545,507 lbs.	1,677,064

The number of bales cannot be ascertained.

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

UNITED STATES WOOL DUTIES.

(CORRESPONDENCE RESPECTING.)

Ordered by the Legislative Assembly to be printed, 20 *April*, 1886.

Cablegram from Premier of New Zealand to Premier of New South Wales.

QUESTION of reducing duty on wool now before Congress, United States. Suggest united action by all Australasian Colonies sending representation through Foreign Office to States, stating that admission of their wool free of duty would be regarded as an act of great friendship to the Anglo-Saxon Colonies on the part of the elder descendant from the same race. The Agents-General could be instructed to aid. Of course no hints even of retaliation or threats should be used. Ask concession on ground of friendship. Will you communicate with different Australian and Tasmanian Governments.

Telegram from Premier of New South Wales to Premiers, Victoria, Queensland, South Australia, Tasmania, and Colonial Secretary, Western Australia.

Sydney, 20 April, 1886.

HAVE received following cablegram from Premier of New Zealand :—

"Question of reducing duty on wool now before Congress, United States. Suggest united action by all Australasian Colonies sending representation through Foreign Office to States, stating that admission of their wool free of duty would be regarded as an act of great friendship to the Anglo-Saxon Colonies on the part of the elder descendant from the same race. The Agents-General could be instructed to aid. Of course no hints even of retaliation or threats should be used. Ask concession on ground of friendship. Will you communicate with different Australian and Tasmanian Governments.

"ROBT. STOUT.

"19th April, 1886."

Please favour me with your views at early convenience. This Government disposed to agree.

Cablegram from Premier of New South Wales to Premier of New Zealand.

Sydney, 20 April, 1886.

HAVE communicated to other Australasian Governments your cablegram of yesterday *re* United States wool duties. Will wire you immediately on receipt of replies. This Government will join in proposed representation to United States.

FC

1885-6.

NEW SOUTH WALES.

IMPORTED STOCK ACT OF 1871, AND IMPORTED STOCK ACT AMENDMENT ACT OF 1884.

(REGULATION UNDER.)

Presented to Parliament, pursuant to Act 48 Vic. No. 12.

[*From the Government Gazette of 29th September*, 1885.]

Department of Mines, Stock Branch, Sydney, 29 September, 1885.

IMPORTED STOCK ACT OF 1871, AND IMPORTED STOCK ACT AMENDMENT ACT OF 1884.

HIS Excellency the Governor, with the advice of the Executive Council, has been pleased to cancel such parts of the Sub-Regulations (1) and (2) of Regulation 16 of 5th January last, 1885, so far as the same relates to dogs, and that portion of Sub-Regulation (11) of Regulation 16 which prescribes the term of quarantine of dogs; and to make the following Regulation, which is hereby published for general information.

JOSEPH P. ABBOTT.

The duration of quarantine to which any dog imported from a port or place not in any of the Australian Colonies shall hereafter be subjected shall be six months from the date on which such dog shall have been put on board such vessel at any such port or place.

1885–6.

NEW SOUTH WALES.

IMPORTED STOCK ACT OF 1871, AND THE IMPORTED STOCK ACT AMENDMENT ACT OF 1884.

(REGULATION IN LIEU OF REGULATION No. 11 OF 1st JULY, 1886,—CANCELLED.)

Presented to Parliament, pursuant to Acts 35 Vic. No. 6, sec. 13, and 48 Vic. No. 12, sec. 4.

Department of Mines, Stock Branch, Sydney, 6th August, 1886.

IMPORTED STOCK ACT OF 1871, AND THE IMPORTED STOCK ACT AMENDMENT ACT OF 1884.

THE following Regulation, made by His Excellency the Governor, with the advice of the Executive Council, under the provisions of the abovenamed Act, is hereby published for general information, in lieu of Regulation No. 11 of 1st July, 1886, which is hereby cancelled:—

HOW IMPORTED AUSTRALIAN SHEEP ARE TO BE ADMITTED OVERLAND FROM OTHER COLONIES.

Sheep imported from any clean Australian Colony into any other clean Colony, and intended to be introduced overland into this Colony, may be admitted if their owner produce the certificates prescribed by Regulations 5, 6, and 10 of 1st July last (1886) under the abovenamed Acts for such sheep, and if they are found on examination by the Inspector for this colony at the border to be not infected; or such sheep may be admitted at the border on inspection as aforesaid if their owner produce to such Inspector a certificate under the hand of the Chief Inspector for the Colony from which they are intended to be introduced that when such sheep were introduced into that Colony they were accompanied by a certificate as prescribed by number 5 of the abovementioned Regulations, and that such sheep have been twice dipped with proper preparations of tobacco and sulphur, or of sulphur and lime, in a bath given at the temperature and of the duration and in the manner prescribed by number 8 of the abovementioned Regulations. But all such sheep, unless they shall have been imported, inspected, quarantined, and dressed as prescribed in this and the abovementioned Regulations, shall, on crossing the border, be placed in quarantine, and kept and dipped in the same manner in every respect as prescribed with regard to Australian imported sheep landed at Sydney.

JAMES FLETCHER.

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

DISEASES IN SHEEP ACTS.

(REVENUE AND EXPENDITURE DURING THE LAST FIVE YEARS.)

Ordered by the Legislative Assembly to be printed, 30 *September*, 1886.

RETURN to an *Order* made by the Honorable the Legislative Assembly of New South Wales, dated 13th August, 1886, That there be laid upon the Table of this House,—

"A Return showing the Revenue and Expenditure under the Diseases in "Sheep Act during the last five years.

(*Mr. R. B. Wilkinson.*)

RETURN showing the Revenue and Expenditure under the Diseases in Sheep Act during the last five years:—

	Revenue.			Expenditure.		
	£	s.	d.	£	s.	d.
1881	14,157	10	2	12,571	16	10
1882	11,997	7	3	13,464	14	8
1883	11,303	3	5	14,698	2	11
1884	11,925	11	10	18,785	7	8
1885	19,891	5	3	19,226	5	6

[84] 952—

[805 copies—Approximate Cost of Printing (labour and material), £1 4s. 9d.]

1885–6.

NEW SOUTH WALES.

DISEASES IN SHEEP ACT OF 1876, AND THE DISEASES IN SHEEP ACTS AMENDMENT ACTS OF 1878 AND 1882.

(REGULATION UNDER.)

Presented to Parliament, pursuant to Act 30 Vic. No. 16, sec. 77.

[*From the Government Gazette, 3rd November*, 1885.]

Department of Mines, Sydney, 3rd November, 1885.

DISEASES IN SHEEP ACT OF 1876, AND THE DISEASES IN SHEEP ACTS AMENDMENT ACTS OF 1878 AND 1882.

HIS Excellency the Governor, with the advice of the Executive Council, has been pleased to approve of the following Regulation under the above-named Acts, which is hereby published for general information:—

When an Inspector of Sheep has to travel 20 miles or more to examine any sheep about to be introduced into this Colony at any of the Crossing-places proclaimed as such on the boundaries of this Colony, he shall be entitled to charge and receive from the owner or person in charge of such sheep expenses at the rate of fifteen shillings per day for the time he is absent from his station in making such examination.

JOSEPH P. ABBOTT.

[3d.] 57—

1885–6.

NEW SOUTH WALES.

PASTURES AND STOCK PROTECTION ACT OF 1880, AND THE PASTURES AND STOCK PROTECTION ACT AMENDMENT ACT OF 1881.

(REGULATIONS UNDER.)

Presented to Parliament, pursuant to Act 44 Vic. No. 11, sec. 30.

[*From the Government Gazette of the 20th November*, 1885.]

Department of Mines, Stock Branch, Sydney, 20 November, 1885.

PASTURES AND STOCK PROTECTION ACT OF 1880, AND THE PASTURES AND STOCK PROTECTION ACT AMENDMENT ACT OF 1881.

Enclosures for keeping Hares.

HIS Excellency the Lieutenant-Governor, with the advice of the Executive Council, has been pleased to approve of the following Regulations, under the above-named Acts, which are hereby published for general information.

GEO. THORNTON.

1. The land upon which it is intended to keep any hares shall be fenced, to the satisfaction of the Minister, with a close and substantial paling fence, not less than 5 feet 9 inches high.

2. Wire netting, not less than 1 foot broad, with mesh not more than 1½ inches wide, shall be properly fixed along the bottom of the fence.

3. Wire netting, not less than 1 foot broad, and mesh not more than 3 inches wide, shall be securely fixed on the top of the fence on strong posts, which shall have an incline of 25 degrees inward, making the fence in all not less than 6 feet 6 inches high.

4. All corners in the fence shall be properly guarded by wire netting, and special attention shall be paid to making the fence secure at creeks, water courses, &c., and such other places as the Inspector shall direct, by means of wire netting or otherwise.

5. A caretaker shall reside on the ground.

6. There shall be no road or thoroughfare through the ground.

7. All gates shall be kept locked, except when opened by caretaker for necessary ingress or egress.

8. No additions shall be made to any land on which hares are kept under permission, as herein provided, without the sanction of the Minister.

9. Live hares shall not be permitted to be taken out of, nor allowed to leave, enclosure.

10. The Minister shall be the sole judge of the sufficiency of the enclosure.

11. If any person commit a breach of any of these Regulations he shall, on conviction, for every such offence, incur a penalty not exceeding £10; and such breach by the person to whom permission shall have been granted hereunder to keep hares shall, or shall not, according as the Minister shall decide, entail the cancellation of such permission.

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

AGRICULTURAL SOCIETIES.

(PARTICULARS OF.)

Ordered by the Legislative Assembly to be printed, 15 *June*, 1886.

RETURN to an *Order* made by the Honorable the Legislative Assembly of New South Wales, dated 21st May, 1886, That there be laid upon the Table of this House, a Return showing:—

"The names of all the Agricultural and kindred Societies in this Colony "which have participated during the ten years ending 31st December, 1885, "in the annual grants to Agricultural Societies, showing the amounts paid "to such Societies in each year during that time; and also the names of all "such Societies that have received special grants during the like period, "showing the several amounts and dates when so paid."

(Mr. Gould.)

592—A

[805 copies—Approximate Cost of Printing (labour and material), £14 18s. 9d.]

AGRICULTURAL

RETURN showing the names of all the Agricultural and kindred Societies in this Colony which have participated during such Societies in each year during that time; and also the names of all such Societies that have received special grants

Name of Society.	Description of grant.	1876.		1877.		1878.		1879.	
		Date.	Amount.	Date.	Amount.	Date.	Amount.	Date.	Amount.
			£ s. d.		£ s. d.		£ s. d.		£ s. d.
Albury and Border Pastoral and Agricultural Society	Annual	.....	.....	May 7 ..	91 4 9	May 3 ..	109 5 11	.....	.....
	do	.....	.....	.....	.....	Dec. 12..	139 0 7	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Armidale and New England Pastoral and Agricultural Society	Annual	.....	.....	May 7 ..	78 2 7	May 6 ..	126 18 7	.....	.....
	do	.....	.....	.....	.....	Dec. 12..	116 3 2	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Bathurst (Western) Pastoral and Agricultural Society	Annual	May 18..	61 7 2	April 27	82 0 8	Dec. 12..	144 14 10	.....	.....
	do	.....	.....	.....	.....	May 1 .	91 15 9	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Braidwood Pastoral and Agricultural Society	Annual	May 18..	35 13 9	May 2 ..	75 2 7	May 1 ..	99 2 5	.....	.....
	do	.....	.....	.....	.....	Dec. 6 ..	84 0 5	.....	.....
Bega Pastoral and Agricultural Society	Annual	May 19 .	29 15 6	May 10..	59 7 3	May 6 ..	44 16 5	July 22 ..	48 1 7
	do	.....	.....	.....	.....	.....	.....	.....	.....
Broughton Creek Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
Burrawang Pastoral and Agricultural Association, and West Camden Farmers' Club.	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Blayney Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	Dec. 6 ..	163 19 1	.....	.....
Bombala Pastoral, Agricultural, and Exhibition Society	Annual	.....	.....	June 6 ..	46 10 3	Dec. 14..	12 18 0	.....	.....
	do	.....	.....	Dec. 12 ..	16 4 3	May 7 ..	60 8 1	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
Burrangong (Young) Pastoral and Agricultural Society	Annual	May 18..	45 14 2	May 8 .	30 17 9	May 2 ..	22 7 5	.....	.....
	do	.....	.....	.....	.....	Dec 12..	77 19 6	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Berrima District Agricultural and Industrial Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Brewarrina Pastoral and Agricultural Society	Annual	.....	.....	May 10 ..	184 0 6	June 28	96 10 1	.....	.....
	do	.....	.....	.....	.....	Dec. 20 .	53 19 8	.....	.....
Bellinger River Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
Clarence River (Grafton) Pastoral and Agricultural Society	Annual	Aug. 21..	66 11 11	May 6 ..	13 5 0	May 6 ..	129 4 0	.....	.....
	do	.....	.....	.....	.....	Dec. 16..	131 18 4	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Clarence River (Grafton) Exhibition Building	Special	.....	.....	.....	.....	.....	.....	.....	.....
Carcoar Pastoral and Agricultural Association	Annual	.....	.....	.....	.....	May 1 ..	80 15 11	.....	.....
	do	.....	.....	.....	.....	Dec 10..	61 13 10	.....	.....
Candelo Pastoral and Agricultural Association	Annual	.....	.....	.....	.....	.....	.....	.....	.....
Corowa Pastoral and Agricultural Society	Annual	.....	.....	May 2 ..	25 19 10	Dec. 20	162 14 10	.....	.....
	do	.....	.....	.....	.....	May 7 ..	143 4 4	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
Cooma Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Cootamundra Pastoral and Agricultural Society	do	.....	.....	.....	.....	.....	.....	.....	.....
	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Crookwell Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Coonabarabran Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Cowra Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
Central Australia (Bourke) Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
Coonamble Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
Central New England Pastoral and Agricultural and Mining Association	Annual	.....	.....	.....	.....	May 8 ..	116 2 10	.....	.....
	do	.....	.....	.....	.....	Dec. 16 .	132 6 10	.....	.....
	do	.....	.....	.....	.....	Dec. 20..	91 9 6	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Deniliquin Pastoral and Agricultural Society	Annual	.....	.....	April 20	289 3 4	Dec. 17 .	439 15 7	.....	.....
	do	.....	.....	.....	.....	May 13..	457 11 1	.....	.....
Dapto Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	May 21 .	21 3 10	.....	.....
	do	.....	.....	.....	.....	Dec. 30 ..	27 6 6	.....	.....
Dubbo (North Western) Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	Dec. 17 ..	110 18 6	.....	.....
	do	May 16..	108 10 6	.....	.....	May 14 ..	100 18 2	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Forbes Pastoral and Agricultural, and Farmers' and Free Selectors' Association	Annual	May 22..	67 17 2	May 15..	116 17 8	May 6 ..	102 10 1	.....	.....
	do	.....	.....	.....	.....	Dec. 13..	160 17 3	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Grenfell Pastoral and Agricultural Society	Annual	.....	.....	May 3 ..	118 1 0	May 8 ..	122 16 8	.....	.....
	do	.....	.....	.....	.....	Dec. 13..	66 7 3	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Goulburn Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Gwydir (Moree) Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
Gulgong Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Germanton Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Hunter River (West Maitland) Pastoral and Agricultural Society.	Annual	May 17 .	133 11 5	April 30	151 5 2	May 7	238 7 7	.....	.....
	do	.....	.....	.....	.....	Dec. 6 .	289 8 10	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Hunter (Upper) Pastoral and Agricultural Society	Annual	.....	.....	May 3 ..	149 13 9	Dec. 12.	118 18 5	.....	.....
	do	May 17..	97 3 11	.....	.....	May 1 ..	182 16 6	.....	.....
Hawkesbury District, Pastoral and Agricultural Society	Annual	May 19..	29 16 5	May 10 .	48 1 7	May 1 ..	42 12 0	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Hawkesbury (Richmond) Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
Hawkesbury (Windsor) Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	Jan. 22..	41 8 4
Hay Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Inverel Pastoral and Agricultural Society	Annual	May 22..	76 18 5	.....	.....	May 9 ..	122 9 3	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....

SOCIETIES.

the ten years ending 31st December, 1885, in the annual grants to Agricultural Societies, showing the amounts paid to during the like period, showing the several amounts and dates when so paid. (Asked for by Mr. Gould, 21st May, 1886.)

1880.		1881.		1882.		1883.		1884.		1885.		Total Annual.	Total Special.
Date.	Amount.	Date.	Amount.	Date.	Amount.	Date.	Amount.	Date.	Amount.	Date.	Amount.		
	£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s d		£ s. d.	£ s. d.	£ s. d.
Jan. 10..	115 10 4	Jan. 4 .	134 18 11	.....	.....	Feb. 2 .	147 15 5	April 19	274 1 3	Mar. 7 ..	791 5 0	1,064 1 7	.....
.....	.....	Nov. 8 ..	112 6 1	.....	.....	July 10..	181 7 0	.....	.....	.....	.....	432 13 8	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Jan. 20 ..	500 0 0	.....	500 0 0
Jan. 8 ..	80 9 0	.....	.....	.....	.....	Feb. 2 .	63 12 0	Dec. 24.	129 11 0	.....	.....	478 13 2	.....
Dec. 30..	55 13 10	.....	.....	.....	.....	Nov. 28..	62 1 0	.....	.....	.....	.....	283 18 0	.....
.....	.....	.....	.....	.....	.....	.....	.....	Dec. 5 ..	150 0 0	.....	.....	.....	150 0 0
Jan. 12..	150 5 10	Jan. 5 ..	129 19 7	.....	.....	Dec. 14..	153 2 3	.....	.... .	Jan. 14 .	341 3 6	1,062 12 10	.....
.....	.....	Dec. 13..	123 0 2	.....	.....	Feb. 7 ..	139 1 8	.... .	.....	.....	....	353 17 7	.....
.....	.....	.....	.....	.....	.....	July 23..	300 0 0	.....	.....	.....	.....	.....	300 0 0
Jan. 10..	82 14 10	.....	... ..	Jan. 17..	55 2 5	Feb. 5 .	43 14 7	.....	.....	Aug. 6 ..	151 12 0	549 2 7	.....
Dec. 30..	59 7 3	.....	.....	.....	.....	Oct. 20..	69 6 0	.....	... ..	.....	.....	212 13 8	.....
Jan. 13..	49 7 3	Nov. 10..	37 18 2	.....	.....	Mar. 6 .	38 16 4	.....	... ..	Jan. 16..	172 0 0	480 2 6	.....
.....	.....	.....	... ..	.....	.....	July 7 ..	116 4 0	.....	.....	Dec. 19.	169 7 0	275 11 0	.....
.....	.....	.....	.....	.....	.....	.....	... .	Feb. 5 ..	73 4 9	Mar. 5 ..	236 5 6	314 10 3	.....
.....	.....	Jan. 10..	97 18 2	.....	.....	Jan. 31 ..	69 15 1	Dec. 10..	150 13 6	.....	.....	327 1 9	.....
.....	.. ...	Nov. 11..	95 12 8	.....	.....	Oct. 16 ..	84 15 0	.....	.....	.....	.....	180 7 8	.....
.....	.....	.....	.....	.....	.....	.....	.....	Dec. 9 ..	125 0 0	Jan. 22..	250 0 0	.....	375 0 0
Jan. 7 ..	86 11 7	Nov. 8 .	29 17 8	.....	.....	July 8 ..	121 11 6	.....	.....	April 2	110 2 0	512 1 10	.....
Jan. 12..	38 19 7	Jan. 5 .	35 17 4	.....	.....	Jan. 31 ..	13 3 5	.....	.....	Mar. 10..	52 10 0	104 18 7	.....
.....	.....	Nov. 26..	17 8 2	.....	.....	Dec. 20..	37 5 6	.... .	.....	.....	.....	181 6 0	.....
.....	.....	.....	.....	.....	.....	Aug 17..	250 0 0	.....	.....	Mar. 13..	250 0 0	.....	500 0 0
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	April 2 ..	250 0 0	.....	250 0 0
Jan. 8 ..	47 12 1	Nov. 8 ..	120 4 10	.....	.....	Jan. 30..	71 2 1	... ..	.....	Nov. 25..	412 6 6	750 4 10	.....
Jan. 7 ..	92 12 6	.....	.....	.....	.....	Nov. 16.	300 9 0	.....	.. ...	May 14.	393 18 9	864 19 9	.....
Dec. 28..	126 14 8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	126 14 8	.....
.....	.... .	.....	.....	.....	.....	May 29 .	150 0 0	.....	.....	.....	.....	.....	150 0 0
.....	.....	.....	.....	.....	.....	.....	.....	Jan. 19..	51 6 6	Mar. 21.	278 17 6	330 4 0	.....
.....	.....	.....	.....	.....	.....	.....	.....	Dec. 5 .	125 0 0	.....	.....	.....	125 0 0
.....	.....	Jan. 5 ..	45 12 6	.....	.....	Feb. 6 ..	51 6 6	Feb. 19..	130 12 6	Mar. 21 .	53 17 0	662 6 0	.....
.....	.....	Nov. 17..	54 8 2	.....	.....	.....	.....	.....	.....	.....	.....	108 2 10	.....
.....	.....	Nov. 15..	14 18 11	.....	.....	Feb. 13..	19 5 0	Feb. 5 ..	23 6 6	.....	.....	57 10 5	.....
Jan. 12..	164 15 8	Jan. 3 ..	100 18 11	.....	.....	Mar. 12..	59 8 2	Mar. 4 ..	16 0 0	Jan. 22..	111 11 0	661 14 3	.....
.....	.....	Nov. 19..	70 11 3	.....	.....	Aug. 7 ..	45 0 0	.....	.....	.....	.....	253 9 7	.....
.....	.....	.....	.....	.....	.....	.....	.....	Dec. 10..	125 0 0	.....	.....	....	125 0 0
.....	.....	.....	.....	June 28..	500 0 0	.....	.....	.....	.....	.....	.....	.....	500 0 0
Dec. 24 .	33 6 7	.....	.....	.....	.....	June 18..	41 6 3	.....	.....	Mar. 12..	14 14 0	170 2 9	.. . ...
Jan. 7 ..	48 18 0	.....	.....	Mar. 8 ..	12 7 6	.....	.....	.....	.....	.....	.....	122 19 4	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Mar. 24 .	186 15 0	185 15 0	.....
Jan. 16..	104 13 9	Nov. 12..	191 17 3	.....	.....	Feb. 5 .	147 12 6	.....	.....	April 2 ..	243 7 11	956 6 1	.....
.....	.....	Jan 10 ..	216 4 8	.....	.....	Dec. 11..	176 13 6	.....	.....	May 18 ..	243 19 0	780 1 6	.....
.....	... ..	.....	.....	... ..	.....	.....	.....	.....	.....	April 2 ..	57 3 1	57 3 1	....
.....	.....	.....	.....	.....	.....	Feb. 2 ..	26 4 1	Mar. 27..	34 12 9	May 21..	146 16 0	207 12 10	.....
.....	.....	.....	.....	.....	.....	July 9 .	43 16 9	.....	.....	.....	.....	43 16 9	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Mar. 16..	300 0 0	.....	300 0 0
.....	.....	Nov. 11..	65 11 4	.....	.....	Jan. 30..	73 18 1	Dec. 10..	107 18 0	April 2..	300 0 0	.....	300 0 0
.....	.. ...	.....	.....	.....	.....	Aug. 27..	55 2 6	.....	.....	Nov. 3 ..	129 15 0	377 2 5	.....
.....	.....	.....	.....	.....	.....	July 16..	300 0 0	.... .	.....	.....	.....	55 2 6	.....
Jan. 10..	44 0 3	Jan. 5 ..	34 16 2	.....	.....	Jan. 31..	16 6 7	Dec. 16..	107 9 6	.....	.....	.....	300 0 0
.....	.....	Nov. 10..	16 19 8	.....	.....	Sep. 27..	20 9 6	.....	.....	.....	.....	202 12 6	.....
.....	.....	.....	.....	.....	.....	Oct 2 .	300 0 0	.....	.....	.....	.....	87 8 9	.....
.....	.... .	Nov. 11..	59 8 4	.....	.....	Feb 2 ..	93 12 0	... ..	.....	Aug. 6 ..	13 13 0	.....	300 0 0
.....	.....	.....	.....	.....	.....	Dec. 14 .	54 19 9	.....	.....	.....	.....	166 13 4	.....
.....	.....	.....	.....	.....	.....	.....	.....	Dec. 16..	50 0 0	.....	.....	54 19 9	.....
Dec. 31..	74 14 10	Nov. 11..	163 14 3	.....	.....	Feb. 9 ..	124 10 4	Feb. 22..	160 13 0	.....	.....	.....	50 0 0
Jan. 16..	138 14 0	Jan. 5 ..	274 6 9	.....	.....	Feb. 6 ..	256 11 0	.... ..	.....	.....	.....	528 12 5	.....
.....	.....	Nov. 22 .	55 17 11	.....	.....	Dec. 14.	206 14 6	.....	.....	.....	.....	689 11 9	.....
.....	.....	Nov. 18..	30 8 7	.... .	.....	Oct. 5 ..	55 10 0	.... .	.....	.....	....	262 12 5	.....
Feb. 7 ..	145 16 6	Jan. 3 ..	88 8 4	.....	.....	Oct. 25..	30 13 9	Dec. 12.	63 0 0	.....	.....	94 18 7	.....
.....	.....	Nov. 17..	40 0 9	.....	.....	Feb. 3 ..	60 4 2	.....	.....	.....	.....	444 1 5	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	232 11 9	.....
.....	.....	.....	.....	.....	.....	Sep. 11.	300 0 0	.....	.....	Sep. 24..	60 18 0	152 7 6	.....
Dec. 30 .	300 17 2	Nov. 22..	346 10 0	.....	.....	Jan. 30..	344 13 3	Dec. 18..	746 1 0	.....	.....	.....	300 0 0
Jan. 12..	371 1 7	.....	.....	... ..	.....	Dec. 17..	317 3 6	Dec. 16..	162 1 6	....	.....	2,567 0 4	.....
Jan. 16..	34 9 0	Jan. 3 ..	22 13 7	.....	.....	Jan. 30..	62 9 7	.....	.....	.....	.....	1,307 17 8	.....
.....	.....	Nov. 15..	36 1 2	.....	.....	Sep. 27.	49 7 0	.....	. ....	.....	.....	140 16 9	.....
Jan. 18..	97 3 10	.....	.....	.....	.....	July 12..	63 8 0	.....	.....	.....	.....	111 14 8	.....
Dec. 30..	75 2 0	Nov. 13..	18 11 4	.....	.....	.....	.....	Dec. 10..	82 10 0	.....	.....	304 0 4	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	303 2 0	.....
Jan. 12..	169 0 9	Feb. 7 ..	133 18 1	.....	.....	Mar. 31.	142 10 7	Sep. 9 ..	300 0 0	.....	.....	.....	300 0 0
.....	.....	Nov. 22..	87 0 6	.....	.....	.....	.....	May 8 ..	102 12 3	Jan. 16..	189 18 0	1,025 4 7	.....
.....	.....	.....	.....	.....	.....	.....	.....	April 3..	36 8 6	.....	.....	274 6 3	.....
.....	.....	.....	.....	.....	.....	July 14..	300 0 0	Dec. 10..	107 12 0	.....	....	107 12 0	.....
Jan. 21..	53 5 5	Jan 3 ..	103 5 3	.....	.....	Feb. 5 ..	62 0 6	.....	.....	.....	.....	.....	300 0 0
.....	.....	Nov. 11 .	39 13 9	.....	.....	.....	.....	Feb. 6..	60 17 0	Mar. 4 ..	313 11 6	883 17 4	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	156 6 0	.....
Dec. 30..	315 7 0	Nov. 10..	228 3 5	.....	.....	Jan. 30..	190 7 6	Dec. 5 ..	100 0 0	.....	.....	.....	100 0 0
.....	.....	.....	.....	.....	.....	May 30..	294 12 9	Dec. 24..	376 11 0	.....	.....	1,110 8 11	.....
.....	.....	.....	.....	Feb. 3 ..	250 0 0	May 29..	300 0 0	Dec. 29..	203 14 0	.....	.....	498 6 9	.....
.....	.....	Jan. 5 ..	23 9 8	.....	.....	Feb. 3 ..	31 13 7	.....	.....	.....	.....	.....	650 0 0
.....	.. ...	Nov. 16..	54 3 7	.....	.....	Dec. 14..	46 2 0	.. ..	.....	May 5 ..	64 5 0	119 8 3	.....
.....	.....	Nov. 11..	26 2 2	.....	.....	Feb. 2 ..	20 7 8	.....	.....	April 15	14 14 0	100 5 7	.....
.....	.....	.....	.....	.....	.....	Dec. 6 ..	27 8 0	.....	.....	.....	.....	61 3 10	.....
.....	.....	.....	.....	.....	.....	Feb. 3 ..	82 15 3	.....	.....	Jan. 14..	286 18 6	369 13 9	27 8 0
.....	.....	.....	. ....	.....	.....	Oct. 25..	110 12 6	.....	.....	.....	.....	110 12 6	.....
.....	.....	.....	.....	.....	.....	.....	.....	Dec. 5 ..	200 0 0	.....	.....	.....	200 0 0
Dec. 30..	196 11 10	Nov. 15..	166 9 5	.....	.....	Jan. 29..	166 0 6	Jan. 23..	388 12 3	Jan. 2 ..	498 4 6	1,939 2 8	.....
Jan. 7 ..	220 12 11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	610 1 9	.....
.....	.....	.....	.....	.....	.....	July 10..	300 0 0	.....	.....	.....	....	.....	300 0 0
Dec. 24..	92 11 9	Nov. 8 ..	76 16 3	.....	.....	Jan. 29..	47 10 2	.....	.....	.....	.....	485 10 4	.....
Jan. 7 ..	119 2 1	.. ..	.....	.....	.....	Dec. 20..	100 11 9	.....	.....	.....	.....	499 14 3	.....
Jan. 6 ..	30 10 9	.....	.....	.....	.....	Nov. 20..	112 13 10	.....	.....	Feb. 14..	481 5 0	739 19 7	.....
.....	.....	.....	.. ...	.....	.....	.....	.....	.....	.....	Dec. 9 ..	181 18 0	181 18 0	.....
.....	.....	.....	.....	.....	.....	.....	.....	Nov. 25..	150 0 0	.....	.....	.....	150 0 0
Dec. 30..	96 8 4	.....	.....	.....	.....	Jan. 30..	120 0 8	... .	.....	.....	.....	216 8 7	.....
Dec. 28.	27 3 6	Nov. 8 ..	114 7 9	.....	.....	.....	.....	.....	.....	.....	.....	182 19 7	.....
Jan. 13..	95 8 9	Jan. 7 ..	56 8 8	.....	.....	Feb. 6 ..	123 3 4	.....	.....	Feb. 16 .	879 15 6	654 15 10	.....
.....	.....	Nov. 15..	105 14 3	.....	.....	.....	.....	.....	.....	.....	.....	105 14 8	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	June 16..	300 0 0	.....	300 0 0
Jan. 13..	104 6 7	Jan. 3 ..	75 11 0	.....	.....	Feb. 13..	88 9 2	Dec. 16..	152 0 0	Sep. 20..	176 0 0	795 14 5	.....
.....	.....	Nov. 12..	65 15 3	.....	.....	Aug. 7 ..	92 10 0	.....	.....	.....	....	153 5 3	.....
.....	.....	.....	.....	June 22	400 0 0	.....	.... .	.....	.....	.....	.....	400 0 0	.....

Name of Society.	Description of grant.	1876.		1877.		1878.		1879.	
		Date.	Amount.	Date.	Amount.	Date.	Amount.	Date.	Amount.
			£ s. d.		£ s. d.		£ s. d.		£ s. d.
Kiama Pastoral and Agricultural Society	Annual	May 18..	118 0 0	May 2 ..	69 8 4	Dec. 16..	142 16 7	.... .	.....
	do	.....	.....	.....	.....	.....	96 16 10	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Lismore Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
Liverpool Plains (Tamworth) Pastoral and Agricultural Society.	Annual	May 19..	151 3 2	May 10 ..	137 16 5	May 6 ..	192 14 10	Jan. 13..	81 17 8
	do	.... .	.....	.....	.....	.. ...	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
Lachlan (Hillston) Pastoral and Agricultural Society	Annual	... ..	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
Moruya Pastoral and Agricultural Society	Annual	May 25..	15 19 7	May 2 ..	25 18 5	May 1 ..	30 0 6	.....	.....
	do	.....	.....	. ....	.....	Dec. 19..	42 8 10	... ..	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Murrumbidgee (Wagga) Pastoral and Agricultural Society	Annual	June 7 ..	177 10 2	May 2 ..	150 6 2	May 1 .	186 9 1	.....	.....
	do	.....	.....	.. ...	.....	Dec. 10..	198 10 10	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
Monaro Pastoral and Agricultural Society	Annual	May 26..	62 6 3	May 8 ..	48 16 2	.....	.....	.....	.....
Mudgee District Pastoral, Agricultural, and Farmers' Association.	Annual	May 12..	46 10 2	June 19 .	32 17 2	May 7 ..	39 5 7	.....	.....
	do	.....	.....	.. ..	.....	Dec. 6 .	43 11 2	. ....	.....
	do	.....	.....	... ..	. ....	.....	.....	.....	.....
	Special	.... .	.....	.....	.....	.....	.....	.....	.....
Molong Pastoral and Agricultural Society	Annual	.....	.....	.. ...	.....	.....	.....	.....	.....
	Special	.....	.....	.....	. ....	.....	.....	.....	.....
Manning River Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	do	. ....	.....	.. ...	.... .	.....	.....	.....	.....
Manning River (Upper) Pastoral and Agricultural Society	Annual	.....	.. ...	.....	.....	.....	.....	.....	.....
Manning River (Taree) Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Annual	.... .	.....	.....	.....	.....	.....	.....	.....
Macleay River (Kempsey) Pastoral and Agricultural Society	Annual	May 31.	28 17 1	.....	.....	.....	.....	.....	.....
Murrurundi Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	May 1 .	15 13 4	.....	.....
	do	.....	.....	.....	.....	Dec. 18..	11 12 9	.....	.....
Moama Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
Milton Pastoral and Agricultural Society	Annual	.... .	.....	.....	.....	Dec. 16.	60 7 4	.....	.....
Namoi (Narrabri) Pastoral and Agricultural Society	Annual	May 22..	60 12 3	May 8 ..	44 2 0	May 13..	37 3 0	.....	.....
	do	.....	.....	.....	.....	Dec. 12..	59 10 3	.....	.....
New England Pastoral and Agricultural Society	Annual	.....	.....	.....	. ....	.....	.....	.....	.....
New England Southern (Walcha) Pastoral and Agricultural Society	Annual	May 22..	64 7 11	May 8 ..	82 9 6	May 3 ..	99 8 2	.....	.....
	do	May 18..	115 7 4	May 11..	93 18 5	.....	.....	.....	.....
	Annual	.....	. .. .	.....	.....	Dec. 6 ..	99 0 6	.....	.....
New England (Uralla) Pastoral and Agricultural Society	Special	.....	.....	.... .	.....	.....	.....	.....	.....
	Annual	.....	.....	.....	.....	.....	.....	.....	.....
Narrandera Pastoral and Agricultural Society	Annual	May 18..	163 4 3	April 27	154 1 5	May 10..	137 9 6	.....	.....
Northern (Singleton) Pastoral and Agricultural Society	do	.....	.....	.. ...	.....	Dec. 6 ..	211 18 10	. ....	.....
North-western Pastoral and Agricultural Society. (See Dubbo)									
Orange Pastoral and Agricultural Society	Annual	May 2 ..	109 2 1	May 2 ..	52 10 0	May 1 ..	66 8 1	.....	.....
	do	. ....	.....	.....	.....	Dec. 12..	54 16 11	.....	.....
	Special	.....	... ..	.....	.....	.....	.....	.....	.....
Parkes Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Port Macquarie Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
Picton and Camden Pastoral and Agricultural Society	Annual	.....	.....	. ....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.. ..	.....	.....	.....	.....	.....
Riverina (Jerilderie) Pastoral and Agricultural Society	Annual	... ..	.....	May 10	138 0 1	May 15..	157 1 5	.....	.....
	do	....	.....	.....	.....	Dec. 24..	45 19 8	.....	.....
Richmond River (Casino) Pastoral and Agricultural Society	Annual	May 14 .	28 6 6	.....	.....	May 14..	23 1 7	Jan. 13..	41 17 11
	do	.....	.... .	.....	.....	... ..	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
	do	.. ...	.....	.....	. ....	. .. .	.....	.....	.....
Richmond Pastoral and Agricultural Society. (See Hawkesbury.)									
Sydney (N.S.W.) Agricultural Society	Annual	Sept. 20	500 0 0	April 14	317 5 4	July 16..	500 0 0	Nov. 25..	300 0 0
	do	April 29	244 9 0	Nov. 17	500 0 0	Dec. 6 ..	449 4 8	.....	.....
	do	.....	.....	Nov. 26	73 4 0	April 26	607 18 8	.....	.....
	do	.....	.. ...	.....	.....	.... .	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	... ..	.....	.....	.....	.....	.....	.....
	Special	.... .	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
Shoalhaven (Terara) Pastoral and Agricultural Society	Annual	May 18..	83 11 8	May 2 ..	83 11 5	May 1 ..	103 16 10	.....	.....
	do	.. ..	.....	.....	.....	Dec. 10..	99 9 6	.....	.....
Singleton Pastoral and Agricultural Society. (See Northern.)									
Tenterfield Pastoral and Agricultural Society	Annual	.....	... ..	May 8 ..	48 11 2	Dec. 18..	22 7 7	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
Taralga Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Tumut Pastoral and Agricultural Society	Annual	May 18..	70 2 6	May 2 ..	81 5 5	May 7 ..	94 1 5	.....	.....
	do	... ..	.....	.....	.....	Dec. 12..	98 10 6	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
Terara Pastoral and Agricultural Society. (See Shoalhaven.)									
Tamworth Pastoral and Agricultural Society. (See Liverpool Plains.)									
Taree Pastoral and Agricultural Society. (See Manning River.)									
Uladulla (Milton) Pastoral and Agricultural Society	Annual	June 2..	23 5 1	May 11..	40 1 9	May 8 ..	48 4 10	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
Uralla Pastoral and Agricultural Society. (See New England.)									
Wargunyah Pastoral and Agricultural Society	Annual	May 25..	57 12 0	May 2 ..	56 16 10	.....	.....	.....	.....
Wellington Pastoral and Agricultural Society	Annual	June 13..	59 6 7	May 7 .	77 8 0	.....	.....	.....	.....
	do	.....	.....	.. ...	.....	.....	.....	.....	.....
Warren Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
	do	.. ...	.....	.....	.....	.....	.... .	.....	.....
Wollongong Pastoral and Agricultural Society	Annual	.....	. ....	.....	.....	... ..	.....	.....	.....
	do	.....	.....	.....	.....	.....	.....	.....	.....
	Special	.....	. ....	.....	.....	.....	.....	.....	.....
Wagga Pastoral and Agricultural Society. (See Murrumbidgee.)									
Wentworth Pastoral and Agricultural Society	Annual	.....	.....	.....	.....	.....	.....	.....	.....
Windsor Pastoral and Agricultural Society. (See Hawkesbury.)									
Walcha Pastoral and Agricultural Society. (See New England.)									
Yass Pastoral and Agricultural Society	Annual	.....	.....	April 20	42 3 4	Dec. 6 ..	73 19 8	.....	.....
	do	.....	.....	.....	.....	May 1 ..	46 4 2	.....	.....
	Special	.....	.....	.....	.....	.....	.....	.....	.....
Young Pastoral and Agricultural Society. (See Burrangong.)									
	Total ..£	.....	2,928 8 11	.....	4,016 4 3	.....	9,270 10 3	.....	518 5 6

1880.		1881.		1882.		1883.		1884.		1885.		Total Annual.	Total Special.
Date.	Amount.	Date.	Amount.	Date.	Amount.	Date.	Amount.	Date.	Amount.	Date.	Amount.		
	£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.
Jan. 7 ..	125 14 2	Jan. 27..	100 13 7	.....	.....	Jan. 30..	111 4 4	.....	.. ...	Sep. 22..	274 2 0	942 0 0	.....
.....	.....	Nov. 14..	103 6 9	.....	.....	Nov. 6 ..	135 17 9	.....	.....	.....	.....	341 1 4	.....
.....	.....	.....	.....	.....	.....	Sep. 7 .	300 0 0	.....	.....	.....	.....	.....	300 0 0
.....	.....	.....	.....	.. ...	.....	.....	.....	.....	.....	Mar. 10..	145 2 0	145 2 0	.....
Dec. 30..	84 10 10	.....	.....	.....	.....	Jan. 30..	72 14 4	Feb. 16..	22 4 0	May 29..	98 10 0	841 11 3	.....
Jan. 18..	85 15 6	.....	.....	.....	.....	Nov. 16..	97 5 9	.....	.....	.....	.....	183 1 3	.....
.....	.....	Nov. 10..	77 3 6	.....	.....	.....	.....	.....	.....	.....	.....	77 3 5	.....
.....	.....	.....	.....	.....	.....	Feb. 5 .	167 1 4	.....	.....	Aug. 19..	266 8 0	433 9 4	.....
.....	.....	.....	.....	.....	.....	Dec. 14..	160 8 0	... ..	.....	.....	.....	160 8 0	.....
Jan. 10..	48 2 0	Nov. 12..	78 15 2	.... .	.....	Feb. 7 ..	136 9 4	Jan. 19.	100 13 3	April 21	192 0 0	627 18 3	.....
Dec. 31..	80 12 0	.....	.....	.....	.....	.....	.....	.....	.....	April 29	120 15 0	249 15 10	.....
.....	.....	.....	.....	Feb. 28..	200 0 0	July 18..	100 0 0	.....	.....	.....	.....	300 0 0	.....
Jan. 7 ..	160 15 8	Nov. 2 ..	102 14 0	.....	.....	Jan. 29..	91 3 6	Jan. 21..	116 16 6	Mar. 9 ..	362 16 0	1,365 0 1	.....
Dec. 28..	159 5 0	.....	.....	.....	.....	.....	. .....	. ....	.....	.....	.....	368 4 10	.....
Dec. 30..	12 2 2	. ....	.....	.....	.....	.....	.....	.....	.....	.....	.. ..	12 2 2	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	... ..	.....	106 2 5	.....
Jan. 8 ..	141 5 8	Dec. 9 ..	25 16 8	.....	.....	Jan. 30..	6 19 3	Feb. 6 ..	87 9 7	Feb. 25..	599 11 0	979 15 1	.....
.....	.....	Jan. 11..	32 17 6	.....	.....	.. ...	.....	.....	.....	.....	.....	81 8 8	.....
.....	.....	Jan. 8 ..	150 15 2	.....	.....	.....	.....	.....	.....	.....	.....	150 15 2	.....
.....	.....	.....	.....	.....	.....	July 6 ..	150 0 0	Dec. 19..	150 0 0	.....	.....	.....	300 0 0
Dec. 24..	170 18 8	Nov. 12..	49 18 1	.....	.....	Jan. 29..	34 2 6	Feb. 20..	28 0 0	Jan. 2 ..	54 10 6	337 9 9	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Mar. 5 ..	200 0 0	.... ..	200 0 0
.....	.....	.....	.....	.....	.....	June 15..	84 0 0	Dec. 18..	186 9 0	.....	.....	270 9 0	.....
.....	.....	.....	.....	.....	.....	June 31..	60 15 1	.....	.....	.....	.....	60 15 1	.....
.....	.....	.....	.....	.. ..	.....	.....	.....	Feb. 16..	22 0 0	Feb. 20..	166 2 0	188 2 0	.....
Jan. 14..	69 9 7	Jan. 5 ..	57 7 3	.....	.....	.....	.....	.... .	.....	.....	.....	126 16 10	.....
.....	.... .	Nov. 17..	53 13 1	.....	.....	.....	.....	. ....	.....	.....	.....	53 13 1	.....
.....	.....	.....	.....	.....	.....	July 2 ..	100 0 0	.....	.....	.....	.....	.....	100 0 0
... ..	.....	Nov. 15..	97 2 1	.....	.....	Feb. 2 ..	34 8 8	April 9..	193 11 3	Feb. 20..	411 10 7	810 9 8	.....
Jan. 7 ..	12 8 7	Nov. 10.	210 12 6	.....	.....	Feb. 8 ..	47 0 0	.....	.....	April 14	31 10 0	316 19 11	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11 12 0	.....
.....	....	....	.....	.....	.....	Feb. 6 .	62 4 1	Jan. 19..	95 16 0	June 24..	166 7 6	324 7 7	.....
Jan. 14..	49 3 4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	100 10 8	.....
Dec. 30..	22 19 8	Nov. 11..	44 5 10	.....	.....	Dec. 3 ..	32 0 6	.....	.....	.....	.....	241 3 3	.....
Jan. 13..	30 13 10	.... .	.....	.....	.....	.....	.. ..	.....	... ..	.....	.....	90 4 1	.....
Jan. 8 ..	85 2 7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	85 2 7	.....
.....	.....	Nov. 8 ..	72 7 9	.....	.....	Feb. 2 ..	10 2 0	.....	.....	Jan. 8 ..	173 16 0	502 11 4	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	209 6 9	.....
.....	.....	Jan. 11..	34 17 9	.....	.....	Jan. 26..	49 15 6	.....	.....	.....	.....	183 13 9	.....
.....	.....	.....	.....	.....	.....	July 12..	200 0 0	.....	.....	.....	.....	.....	200 0 0
.....	.....	Nov. 12..	112 9 8	.....	.....	Feb. 2 ..	70 2 6	Jan. 8 ..	58 4 6	Jan. 10..	286 3 0	521 19 8	.....
Dec. 23..	265 9 3	Nov. 3 ..	210 1 10	.....	.....	Jan. 29..	160 7 2	Feb. 13..	165 17 0	Jan 30	350 13 6	1,598 3 11	.....
Jan. 7 ..	165 18 11	.....	.....	.....	.....	.....	.....	.....	.. ...	.....	.....	377 17 9	.....
Dec. 30..	65 3 3	Nov. 8 ..	64 1 11	.....	.. ...	Jan. 30..	69 13 5	Feb. 16..	116 7 0	May 16..	192 12 0	715 17 9	. .....
Jan. 8 ..	135 15 4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	190 12 3	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	May 9 ..	750 0 0	.....	750 0 0
Jan. 12..	61 14 6	Jan. 6 ..	75 7 7	.....	.. ..	Jan. 30..	34 19 4	Dec. 10..	81 16 0	.....	.....	253 17 5	.....
.. ..	.....	Nov. 10..	63 16 6	.....	.....	Oct. 22..	34 15 6	.....	.....	.....	.....	98 12 0	.....
.....	.....	.. .	.....	.....	... ..	.....	.....	Nov. 26..	100 0 0	.....	.....	.....	100 0 0
.....	.....	... ..	.. ..	.....	.....	.....	.....	.....	.....	Jan. 9 ..	162 12 0	162 12 0	.....
.....	.. ...	.....	.....	.....	.. ..	Jan 29..	58 0 7	.....	.....	June 16..	433 14 6	491 15 1	.....
.....	.....	.....	.....	.....	... ..	Dec. 15..	60 9 9	. ...	.....	.....	.....	60 9 0	.....
.....	.....	.....	.....	.....	.....	.....	.....	... .	.....	March 5	100 0 0	.....	100 0 0
Jan. 16..	40 1 8	Jan 3 ..	91 11 9	.....	.....	Feb. 2 ..	114 2 8	.....	.....	Jan. 10..	152 9 0	608 6 7	.....
.....	.....	Nov. 12..	118 7 4	.... .	.....	Dec. 14..	76 12 3	.....	.....	.....	.....	240 19 3	....
Jan. 23..	89 14 9	Jan. 14..	22 2 10	.. .	.....	Feb. 16..	22 7 9	Jan 17..	36 13 0	Feb. 14..	159 9 6	373 13 10	.... ..
.....	.....	Nov. 18..	27 1 7	.....	.. ...	.....	.....	... ..	.....	Dec. 3 ..	182 7 6	209 9 1	.....
.....	.....	.... .	.....	.....	.....	.....	.....	Dec. 5 ..	125 0 0	....	.....	.. ....	125 0 0
.....	.....	. ..	. ...	.....	.....	.....	.....	Dec. 5 ..	150 0 0	.. .	.....	.....	150 0 0
Dec. 23..	209 18 9	Aug. 24..	250 0 0	Aug. 2 ..	250 0 0	Jan. 31..	67 7 4	Dec. 10..	1108 3 0	Oct. 15..	1,940 5 0	5,442 19 5	. .... .
Jan. 5	196 10 8	Nov. 14..	51 17 9	.....	... ..	Sept. 27	194 10 3	...	.....	May 4 ..	112 7 0	1,748 19 4	.....
.....	.....	. ..	...	.....	.....	.....	.....	.. .	... ..	May 4 ..	43 18 0	724 15 8	.....
.....	....	.....	.. ...	.....	.....	.....	.....	.....	.....	June 19	998 8 10	998 8 10	.....
.....	.....	.....	.....	.. ...	.....	. ..	. .....	.....	.....	July 28..	36 15 0	36 15 0	. .....
.....	.....	.....	.....	.....	.....	.....	.....	.. .	...	Aug. 8 ..	170 1 0	170 1 0	. .. ...
.....	.....	. .. .	.. ...	Feb. 17..	996 15 0	Jan. 19..	145 13 0	.	. ....	.....	.....	1,142 8 0	.....
.....	.....	.....	.....	March 13	891 4 0	Nov. 24..	1,268 17 9	.....	.....	.. .	.....	2,150 1 9	....
.....	.. ..	.....	.....	April 28	732 3 0	May 12..	5,000 0 0	... ..	.....	...	.....	5,732 3 0	.....
.....	.....	.....	.....	Sept. 2..	611 3 8	.....	.....	....	. ...	.....	.....	611 3 8	.... ..
Jan. 7 ..	83 6 8	Nov. 10..	48 9 0	.....	.....	Jan. 30..	58 19 4	.....	.....	Feb. 13..	161 9 6	623 4 5	.....
Dec. 30..	61 11 6	.....	.....	...	.....	Sept. 6..	112 10 3	.....	.....	.. ...	.....	273 11 3	.....
Jan. 18..	60 17 2	Jan 5 ..	51 19 11	.....	.. ..	Feb. 6 ..	29 14 3	Jan. 21..	46 0 0	Feb. 20..	82 0 0	350 10 1	.....
.....	.....	Nov. 14..	35 18 5	.....	.....	.....	.....	Nov. 20..	27 1 3	.....	.....	62 19 8	.....
.....	.....	Nov. 10..	17 4 10	.... .	.....	Jan. 30 .	23 7 2	Dec. 10..	109 13 6	Dec 13 .	107 17 0	258 2 6	.....
.....	.....	.....	.....	.....	.....	Nov. 8 .	22 10 6	.....	.....	.....	.....	22 10 6	.....
.....	.....	.....	.....	.....	....	.....	.....	Dec. 3 ..	150 0 0	.....	.....	.....	150 0 0
Dec 30..	58 9 6	Nov. 3 ..	58 0 6	.....	.....	Feb. 8 ..	48 14 5	.. ..	.....	Aug. 6 ..	227 17 0	638 10 9	.....
Jan. 16..	68 2 10	.....	.....	... ..	.....	Dec. 20..	60 12 0	.....	.....	.....	.....	227 14 4	.....
.....	.....	.....	.....	.....	.....	May 21..	100 0 0	Dec. 5 ..	150 0 0	. ....	.....	.....	250 0 0
.....	.....	.....	.....	.....	.. ..	July 19..	100 0 0	. ..	.....	.. ...	.....	.....	100 0 0
Dec. 28..	36 1 4	Nov. 10..	45 15 7	.....	.....	Feb. 2 ..	36 12 9	Dec. 30..	103 18 6	Dec. 15..	124 6 0	458 5 10	.....
.....	.....	.....	... ..	.....	.....	Oct. 12..	48 8 0	.....	.....	.....	.....	48 8 0	.....
.....	.....	.....	.....	.....	.....	.. ...	.....	.....	.....	.....	.....	114 8 10	.....
Dec. 30..	8 9 2	Nov. 17..	40 12 11	.....	.....	.....	.....	.....	... ..	Jan. 14..	52 12 6	238 9 2	.....
Jan. 12..	121 2 11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	121 2 11	.....
.....	.....	Jan. 5 ..	76 15 9	.....	....	Dec. 4 ..	78 2 6	.....	.....	Aug. 19..	201 2 0	356 0 3	... .
.....	.....	Nov. 15..	71 18 11	.....	.....	.....	.....	.....	.....	.....	.....	71 18 11	.....
.....	.....	.....	.....	.....	.....	Jan. 30..	32 15 6	.....	.....	Oct. 22..	305 10 0	338 5 6	.....
.....	.....	.....	.....	.....	.....	Dec. 11..	98 2 9	.....	.....	.....	.....	98 2 9	.....
.....	.... .	.....	.....	.....	.....	.....	.....	Nov. 28.	150 0 0	.....	.....	.....	150 0 0
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Nov. 4 ..	195 13 0	195 13 0	.....
Dec. 24..	42 5 4	Nov. 8 ..	84 5 5	.....	.....	Jan. 30..	35 10 8	Jan. 18..	76 1 6	May 5 ..	68 18 0	422 3 11	.....
Jan 7 ..	68 2 10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	114 7 0	.....
.....	.....	.....	.. ..	.... .	.....	July 6 ..	150 0 0	....	.....	.... .	.....	. .....	150 0 0
.....	7,367 7 1	.....	7,201 0 4	.....	4,898 16 7	.....	19,270 9 1	.....	8,782 3 7	.....	19,965 8 2	78,936 4 9	10,277 8 0

Sydney: Thomas Richards, Government Printer.—1886.

[6*d*.]

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

FAILURE OF CROPS.

(PETITION FOR FREE GRANT OF SEED WHEAT—FARMERS OF EUGOURA.)

Received by the Legislative Assembly, 13 *April*, 1886.

To the Honorable the Speaker and Members of the Legislative Assembly of New South Wales, in Parliament assembled.

The Petition of the undersigned Farmers of Eugoura and surrounding District,—

HUMBLY SHOWETH :—

That your Petitioners have sustained heavy losses through the disastrous drought from which the Colony has of late years been suffering,—a drought which has brought a great many of us to the brink of ruin, through the continued failure of our crops.

The year 1885 has been above all others the most trying, disheartening, and ruinous of all seasons to our industry, many having no crops at all, and many others reaping not more than two or three bushels to the acre, while others have had to turn in their stock to save them from starvation.

We most respectfully, therefore, desire to point out to your Honorable House that in many instances, owing to the all but complete failure of crops, many farmers this year in this neighbourhood are now left almost helpless and penniless, and totally unable to find seed to sow their lands for the coming season. We, your Petitioners, therefore humbly pray that your Honorable House will take our sad case into your most favourable consideration, and grant us seed wheat for the coming season, and thus save us from total ruin.

And your humble Petitioners, as in duty bound, will ever pray.

[*Here follow* 16 *signatures.*]

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

LOSSES OF STOCK FROM NOXIOUS OR POISONOUS PLANTS.

(PARTICULARS OF.)

Ordered by the Legislative Assembly to be printed, 8 *October*, 1886.

Return in reply to a Question asked by A. Ross, Esquire, M.D., M.P., in the Legislative Assembly, on 16*th September*, 1886, *respecting Losses of Stock from Noxious or Poisonous Plants, as follows:—*

9. DR. ROSS *to ask* THE SECRETARY FOR MINES:—

(1.) Will he enumerate or furnish a list of the various noxious or poisonous plants, of which sheep and cattle are alleged to have partaken and died, in the various districts throughout the Colony, and the approximate number of each that have been annually destroyed from this cause?

(2.) Will he submit a list of the respective districts in which such alleged poisonous or noxious weeds exist?

(3.) As a rule are such alleged noxious weeds confined to private or to Crown Lands, and in what ratio?

(1.) NEW SOUTH WALES PLANTS KNOWN TO BE HIGHLY POISONOUS TO STOCK.

Zygophyllum apiculatum—Hab., Molle's Plains.
Zygophyllum glaucescens—Hab., Erskine, Lachlan, and Darling Rivers.
Zygophyllum iodocarpum—Hab., between the Darling and the Lachlan Rivers.
Zygophyllum fruticulosum—Hab., Mitchell, Darling River.
Drosera Arcturi (Sundew)—Hab., Mount Kosciusko.
Drosera glanduligera (Sundew)—Hab., George's River.
Drosera pygmœa (small Sundew)—Hab., Race-course, Parramatta, and Jervis Bay.
Drosera spathulata (spoon-shaped Sundew)—Hab., common about Port Jackson, northward to Hastings River.
Drosera binata (Sundew)—Hab., Port Jackson, Blue Mountains, and Illawarra.
Drosera auriculata (Sundew)—Hab., Port Jackson, northward to Clarence River, southward to Twofold Bay.
Dresera peltata (Sundew)—Hab., Port Jackson.
Swainsonia Greyana (Darling Pea)—Hab., flats on the Darling River, Mudgee, and Dubbo.
Swainsonia lessertiifolia—Hab., Nangus.
Euphorbia Sparmanni (Spurgewort)—Hab., East Coast, Manly Beach, Howe's Island.
Euphorbia australis (Spurgewort)—Hab., near the Barrier Range.
Euphorbia Drummondii (Spurgewort)—Hab., Port Jackson, New England, Barrier Range, Lachlan and Darling Rivers (a very virulent poisonous plant).
Euphorbia Macgillivrayi (Spurgewort)—Hab., Clarence River, New England.
Euphorbia eremophila (Spurgewort)—Hab., Murray and Clarence Rivers, Darling River to Barrier Range, New England.
Excœcaria Agallocha—Hab., Islands and sea-coast Northern District.
Goodia lotifolia (yellow pea flowering shrub)—Hab., Hastings River.
Trachymene Pilosa—Hab., Port Jackson.
Lobelia gibbosa—Hab., Port Jackson to the Blue Mountains, New England, Hastings River.
Lobelia dentata—Hab., Port Jackson to Blue Mountains, Clarence River.
Lobelia gracilis—Hab., Port Jackson to the Blue Mountains.
Lobelia trigonocaulis—Hab., Hastings and Macleay Rivers, New England.
Lobelia anceps—Hab., Port Jackson, Hastings, and Clarence Rivers, Twofold Bay, Howe's Island.
Lobelia purpurascens—Hab., Port Jackson to the Blue Mountains, New England, Hastings and Macleay Rivers.
Pratia erecta—Hab., Paterson, Lachlan, and Macquarie Rivers.
Pratia puberula—Hab., Glendon.
Pratia pedunculata—Hab., Hunter River.
Isotoma axillaris—Hab., crevices of rocks, near Bathurst, New England, Mount Mitchell, between the Lachlan and Darling Rivers.

Solanum—

Solanum nigrum (Black fruiting Nightshade)—Hab., Port Jackson, common northward to Hastings River, New England; southward to Gabo Island, in the interior, on the Darling River.
Solanum—All the introduced and now naturalized European annual species.
Nicotiana suaveoleus (tobacco)—Hab., Port Jackson to the Blue Mountains, Macleay and Hastings Rivers, southward to Kiama, in the interior from Lachlan and Darling Rivers to the Barrier Range.
Omalanthus populifolius—Hab., Port Jackson to the Blue Mountains, northward to Hastings, Clarence, and Richmond Rivers, southward to Illawarra, Twofold Bay.

New South Wales plants suspected to be poisonous to stock, but their poisonous properties have not yet been tested:—

Swainsonia galegifolia (a kind of Darling pea)—Hab., Port Jackson, Hunter River, northward to New England, Macleay, Hastings, and Clarence Rivers, in the interior to the Macquarie, and Darling.
Swainsonia brachycarpa—Hab., New England, Clarence River.
Swainsonia phacoides—Hab., Darling River.
Swainsonia Burkittii—Hab., between the Lachlan and Darling Rivers.
Swainsonia oligophylla—Hab., Darling River.
Swainsonia procumbens—Hab., Liverpool and Dundas Plains, open downs on the Gwydir, Darling, and Castlereagh Rivers.
Swainsonia phacifolia—Hab., Darling River, Flinder's Range.
Swainsonia oroboides—Hab., in the interior, head of Gwydir, New England.
Swainsonia monticola—Hab., Blue Mountains, Nangas, ridges between Curacan and Canowindra.
Swainsonia microphylla—Hab., Hunter River, sandy plains between Wellington and Dubbo, between the Darling and Cooper's Creek.
Swainsonia Fraserii—Hab., Macquarie and Hastings Rivers.
Swainsonia laxa—Hab., on the Darling.
Trachymene cyanopetala—Hab., between the Upper Bogan and Lachlan Rivers.
Trachymene australis—Hab., north of Bathurst, Mooni Creek, New England.
Trachymene glaucifolia—Hab., near Duroodoo, towards the Barrier Range.
Trachymene incisa—Hab., Port Jackson to the Blue Mountains, New England, Hastings, Clarence, and Gwydir Rivers.
Solanum aviculare (Nightshades)—Hab., Port Jackson to the Blue Mountains, northwards to Hastings River, southwards to Twofold Bay.
Solanum simile—Hab., Darling and Murray Rivers.
Solanum verbascifolium—Hab., Clarence River.
Solanum Stelligerum—Hab., Port Jackson to the Blue Mountains, New England, Clarence and Hastings Rivers.
Solanum parvifolium—Hab., Liverpool Plains, Macnamara Hills, Mount Murchison.
Solanum ferocissimum—Hab., Lachlan River, and between it and the Upper Bogan, Darling, Peel's Range, Mount Murchison.
Solanum violaceum—Hab., Paterson, Clarence, Hastings, and Richmond Rivers, Blue Mountains, Glendon.
Solanum amblymerum—Hab., Macquarie River, New England.
Solanum esuriale—Hab., from the Murray, Lachlan, and Darling, to the western frontier, Peel's Range.
Solanum chenopodinum—Hab., from the Darling River to the Barrier Range, Mount Murchison.
Solanum densevestitum—Hab., New England, Hastings River, Mount Lindsay.
Solanum semiarmatum—Hab., Clarence and Richmond Rivers.
Solanum sodomœum—Hab., Port Jackson, and various parts of the Colony.
Solanum armatum—Hab., Port Jackson to the Blue Mountains, Hastings River.
Solanum pungetium—Hab., Port Jackson, Illawarra.
Solanum eremophilum—Hab., Macquarie River.
Solanum campanulatum—Hab., Port Jackson and Grose River, Kurrajong, New England, Clarence River.
Solanum cinereum—Hab., Grose, Hunter, Mackenzie, Nepean, and Gwydir Rivers, near Bathurst, Liverpool Plains.
Solanum lacunarium—Hab., Deserts of the Murray and Darling.
Solanum petrophilum—Hab., Mutanic Ranges.
Solanum ellipticum—Hab., Peel's Range, Mount Murchison, Darling River, thence to the Barrier Range.
Gompholobium latifolium (yellow pea flower)—Hab., Port Jackson, Port Stephens.
Gompholobium Huegelii—Hab., Port Jackson to the Blue Mountains, New England, and to the southward.
Gompholobium grandiflorum—Hab., Port Jackson to the Blue Mountains.
Gompholobium virgatum—Hab., Port Jackson to the Blue Mountains, Port Stephens.
Gompholobium minus—Hab., Port Jackson.
Gompholobium uncinatum—Hab., Blue Mountains, Parramatta, New England.
Gompholobium glabratum—Hab., Port Jackson.
Gompholobium pinnatum—Hab., Port Jackson.
Irema aspera—Hab., Port Jackson to the Blue Mountains, northwards to Hastings and Macleay Rivers and New England, southwards to Illawarra.
Oxylobium ellipticum—Hab., Port Jackson, Argyle County, Illawarra, Clarence and Hastings Rivers.
Oxylobium cordifolium—Hab., Port Jackson, Botany Bay.
Oxylobium Pultenece—Hab., Port Jackson, Hunter River, near Wollomby, Blue Mountains.
Oxylobium scandens—Hab., Port Jackson, Parramatta, Blue Mountains, Hastings River.
Oxylobium procumbens—Hab., Manero.
Oxylobium trilobatum—Hab., Port Jackson, northwards to Clarence and Hastings Rivers, Hunter River, New England, southward to Illawarra, Twofold Bay. Some of the worst poison plants of S.W. Australia belong to the genera Gompholobium and Oxylobium.
Oxylobium staurophyllum—Hab., Port Jackson, Blue Mountains, Macleay River, Lachlan District.
Lotus Australis—Hab., Hunter and Macquarie Rivers, northward to Clarence River, New England, and in the interior to the Murray.
Indigofera australis (Native Indigo)—Hab., Port Jackson to the Blue Mountains; Hunter River, northwards, to Hastings and Clarence Rivers; New England, southwards to Argyle County, Twofold Bay, in the interior to Darling and Lachlan Rivers.

Tephrosia purpurea—Hab., Hunter and Clarence Rivers.
Myriogyne minuta—Hab., Port Jackson to the Blue Mountains, Clarence River, in the interior to Lachlan and Darling Rivers.
Duboisia myoporoides—Hab., Port Jackson to the Blue Mountains; Hastings, Clarence, and Richmond Rivers; Port Macquarie, southwards to Illawarra.
Anthocercis scabrella—Hab., Nepean River.
Anthocercis albicans—Hab., Pine Hills, near Bathurst; near Cassilis.
Anthocercis Eadesii—Hab., near Camden.
Anthocercis Hopwoodii—Hab., Darling River, very rare.
Gratiola pedunculata—Hab., Port Jackson, New England, Richmond River, Darling Downs.
Gratiola peruviana—Hab., Port Jackson to the Blue Mountains; Hastings, Macleay, and Clarence Rivers; Illawarra.
Stypandra glauca—Hab., Port Jackson to the Blue Mountains, Liverpool Plains, New England, in the interior to Lachlan River.
Stypandra Cæspitosa—Hab., Port Jackson to the Blue Mountains, northwards to New England, Newcastle, Mount Mitchell, in the south-western interior.
Stypandra umbellata—Hab., Port Jackson to the Blue Mountains. The abovenamed species of stypandra are accused, particularly in South-west Australia, of causing the blind disease in sheep.

Note.—This list of poisonous, or suspected to be poisonous, plants has been compiled from information obtained from Baron Mücller, K.C.M.G., F.R.S., &c., Government Botanist, Melbourne; and supplemented by information furnished by the Inspector of Forests, Sydney.

There is no record of the number of cattle and sheep that have been destroyed by eating these plants.

(2.) New South Wales Poisonous Plants, or Plants suspected to be poisonous to Stock, specimens of which have been received from the Inspectors of Stock, specifying the districts where the plants are found growing.

From the Inspector of Stock, Tamworth.

Euphorbia Drummondii (Spurgewort)—Hab., Port Jackson, Lachlan and Darling Rivers, from thence to the Barrier Range, New England; also in Queensland, Victoria, Tasmania, and South and West Australia. A poisonous plant.

From the Inspector of Stock, Murrurundi.

Swainsonia Greyana (Darling Pea)—Hab., Flats on the Darling River, Mudgee, Dubbo; also in Victoria and South Australia. A poisonous plant.

From the Inspector of Stock, Coonamble.

Pimelia simplex (suspected to be poisonous)—Hab., Coonamble; also in Victoria and South Australia.

From the Inspector of Stock, Ivanhoe.

Myoporum deserti sp. (Dogwood), suspected to be poisonous.
Euphorbia Drummondii (Spurgewort) a poisonous plant—Hab., Port Jackson, Lachlan and Darling Rivers; from thence to the Barrier Range, New England; also in Queensland, Victoria, Tasmania, and South and West Australia.
Also eleven species of fodder shrubs not yet identified.

From the Rabbit Inspector, Mossgiel.

A collection of dried specimens of eighty-one species of fodder, grasses, and shrubs from the Mossgiel district.

From the Inspector of Stock, Cobar.

A copy of the census of the flora of the Cobar district, compiled by Mr. Hans C. Andra, enumerating the poisonous fodder and other plants indigenous to the district, the former of which are included in Baron Mücller's list of poisonous plants.

From the Inspector of Stock, Moama.

Bulbine bulbosa (wild onion, yam)—This plant is said to be very sickening to cattle, and to cause butter to have a very disagreeable flavour. Hab., Port Jackson to the Blue Mountains, northwards to New England and Clarence River; in the interior from the Darling to the western frontier.

From the Inspector of Stock, Forbes.

A specimen of a plant from Forbes, said to be very poisonous, but not yet identified.

From the Inspector of Stock, Narrabri.

Swainsonia Greyana (Darling pea)—A poisonous plant. Hab., Flats on the Darling River, Mudgee, Dubbo; also in Victoria and South Australia. A poisonous plant.
Euphorbia Drummondii (Spurgewort)—A poisonous plant. Hab., Port Jackson, Lachlan and Darling Rivers; from thence to the Barrier Range, New England; also in Queensland, Victoria, Tasmania, and South and West Australia.
Eremophila maculata—Not known whether poisonous or not. Hab., Murray, Darling, and Lachlan Rivers to the Barrier Range; junction of the Murray and Murrumbidgee; also in Queensland, Victoria, and South Australia.
Euphorbia eremophila (Spurgewort)—A poisonous plant. Hab., Murray and Darling Rivers, thence to the Barrier Range, Clarence River, New England; also in Queensland, Victoria, South and West Australia.
Atriplex sp.?—An edible shrub.
Atriplex sp.? (saltbush)—An edible shrub.

Erodium

Erodium cicutarium (crowsfoot)—An excellent dwarf fodder plant. Hab., between the Lachlan and Darling Rivers, Twofold Bay; also in Victoria, Tasmania, South and West Australia, Europe, and temperate Asia.

From the Inspector of Stock, Euston.

Lotus Australis—Suspected to be poisonous—Hab., Hunter and Macquarie Rivers, northwards to Clarence River, New England, and in the interior, to the Murray; also in Queensland, Victoria, Tasmania, South and West Australia.

Also 40 specimens of miscellaneous plants not yet identified.

From Mr. Corry, Terry-Hie-Hie Station *via* Moree, reporting the loss of 500 sheep through eating a poisonous plant, and forwarding a specimen of it for identification.

The plant is—

Beyeria viscosa, and the Government Analyst reports that from an examination he made of it he believes the result proves it to be poisonous—Hab., Blue Mountains, Liverpool Plains, Moree River, between the Lachlan and Bogan Rivers, New England; also in Queensland, Tasmania, and West Australia.

From Mr. Duncan Carson, Owenyeran Run, Warrego District, Queensland.

Euphorbia sp. ?—Supposed to be poisonous to stock, but the species cannot be identified in the absence of flowers and fruit.

From the Inspector of Stock, Molong.

Forwarding three specimens of plants which the owner of Loombah Station considered had poisoned a number of his sheep. The three plants are:—

Ranunculus lappaceus (Buttercup), suspected to be poisonous—Hab., in boggy and swampy localities, Port Jackson and in the interior, common; also in Victoria, Tasmania, South and West Australia.

Acæna sanguisorba, not poisonous—Hab., Port Jackson, Blue Mountains, Gwydir and Hastings Rivers, southwards to Illawarra, Gabo Island; also in Victoria, Tasmania, South Australia, and New Zealand.

Euphorbia Drummondii (Spurgewort), a poisonous plant—Hab., Port Jackson, Lachlan and Darling Rivers; from thence to the Barrier Range, New England; also in Queensland, Victoria, Tasmania, and South and West Australia.

From the Inspector of Stock, Gunnedah.

Argemone mexicana—A native of Mexico and now a naturalized weed in several parts of New South Wales. It belongs to the Order Papaveraceæ or poppy family; resembles a thistle, and is most probably poisonous to stock. The Inspector of Stock at Gunnedah reported the death of 160 head of cattle through eating this plant.

From the Inspector of Stock, Corowa.

Solanum ensuriale, suspected to be poisonous—Hab., between Corowa and Urana, Peel's Range, from the Murray, Lachlan, and Darling to the western frontier; also in Queensland, Victoria, and South Australia.

From Mr. Stock Inspector Copeland.

Reporting losses of stock through eating—

Casuarina glauca (Belah). This is not considered a poisonous plant, although from its nature it would probably cause constipation of the bowels to animals eating it. Hab., Port Jackson, Blue Mountains, Liverpool Plains, New England, Lachlan and Darling Rivers, towards the Barrier Range.

(3.) The poisonous, or suspected poisonous, plants of New South Wales will be found on both private and Crown Lands, but in what ratio cannot be stated.

Sydney: Thomas Richards, Government Printer.—1886

[3*d*.]

1885-6.

NEW SOUTH WALES.

RABBIT NUISANCE ACT OF 1883.

(REGULATIONS UNDER.)

Presented to Parliament, pursuant to Act 46 Vict. No. 14, sec. 45.

Department of Mines, Rabbit Branch,
Sydney, 10th September, 1885.

RABBIT NUISANCE ACT OF 1883.

THE following Regulations, which have been made by His Excellency the Governor, with the advice of the Executive Council, for the purpose of carrying into effect the objects of the abovenamed Act, shall come into operation on and after the 1st day of November, 1885.

JOSEPH P. ABBOTT.

I.—INSPECTORS' POWERS AND DUTIES.

1. Inspectors when giving any authority to any person, pursuant to the provisions of the above Act, shall give such authority in writing in the form or to the effect of Form 1 hereto; and every person holding any such authority shall produce it on demand by any Inspector or by the owner of the land on which the authority is to be exercised. Persons holding any such authority are hereinafter termed "Assistants."

2. Inspectors or their Assistants, whenever practicable, before entering the first time upon any land, or otherwise within twenty-four hours after making entry thereon, shall give the owner notice in writing of such entry in the form or to the effect of Form 2 hereto.

3. Inspectors and their Assistants entering upon any land, pursuant to the provisions of the 9th section of the above Act, may—

(1.) After having given the owner not less than seven days' notice in the form or to the effect of Form 3 hereto, lay poison on any land, and shall on doing so post a notice in a prominent position near the place where the poison is laid, stating where such poison has been laid.

(2.) Lay poison in or about, or fumigate, dig out, or stop up any rabbit burrows or holes on such land; and may, after fourteen days' notice to the owner, cut down or destroy by fire any scrub or brushwood.

(3.) With the sanction of the Minister, cut down, or destroy by fire, or remove any brushwood, or log, or other fence, or remove any stone wall on any such land which is in their opinion a harbour or cover for rabbits; but, before proceeding to destroy or remove any such fence or wall, they shall give the owner of such land, and any other owner whose land is enclosed or bounded by such fence or wall, not less than one month's notice of the intention to destroy or remove the same.

II.—RECEIVERS.

4. Each Rabbit Inspector shall be the Receiver, under the Rabbit Nuisance Act of 1883, for the Rabbit District of which he has charge; and all Sheep Inspectors, Forest Rangers, and any persons whom the Minister may specially authorize by notice in the Government Gazette, shall also, for the purposes of the said Act, be deemed to be Receivers within the limits prescribed by such notice.

5. Each Receiver shall visit every holding within his district periodically in rotation for the purpose of receiving rabbit skins with scalps attached.

6. Owners delivering rabbit skins, with scalps attached, to the Receiver shall, together therewith, produce vouchers under the hand of the persons from whom they were obtained, and attested by a witness, showing what rate of remuneration had been paid to the persons who procured such skins; and the Receiver, if satisfied with the genuineness of any such voucher, shall initial and date the same.

7. The Receiver, upon taking delivery of the skins with scalps attached, shall carefully count them, and shall then destroy them by fire, unless the owner from whom he takes delivery desires to retain the skins, in which case the Receiver shall cut off the scalp only, and destroy it by fire.

8. As soon as the Receiver shall have destroyed the skins and scalps, or the scalps only as aforesaid, he shall give to the owner a certificate, under his hand, in the form of Form 4 hereto, of the number of skins with scalps attached received from such owner, but he shall not include in any such certificate any skin from which the scalp had been cut off before it was received by him.

9. In all cases if the Inspector is of opinion that proper and sufficient care is not taken to secure the skins and to prevent any person other than the owner or person authorized by him having access to them, or removing them from the place of security, he shall destroy them.

III.—SUBSIDIES.

10. Every owner intending to make any claim under section 18 of the said Act shall, before commencing the work necessary to destroy rabbits on his land, give at least fourteen days' notice to the Minister for Mines of his intention to make such claim.

11. All applications for payment under the said 18th section shall be made in the form of Form 7 hereto, and shall be accompanied by vouchers for the amounts stated to have been paid, and by the proper Receiver's certificate, and shall be also accompanied by a statutory declaration made by the claimant that all the expenditure was made as alleged in such application and vouchers.

12. The amount of such claims as approved by the Minister shall be paid quarterly.

13. Any Superintending Inspector or Inspector under the abovenamed Act shall have the right at all reasonable times to inspect all books of accounts belonging to any owner who claims subsidy.

IV.—Miscellaneous.

14. All owners of infested land shall keep a journal in Form 5 hereto, which shall be open at all times to the inspection of any Inspector or any Assistant, and such owner shall also within one week before the last day of each month make a return to the Inspector, in Form 6 hereto.

15. All notices under section 38 of the said Act of rabbits being on any land shall be in the form or to the effect of Form 8 hereto.

16. All appeals under section 24 of the said Act shall be in the form or to the effect of Form 9 hereto.

17. If any person commits a breach of any of the foregoing regulations he shall, on conviction for every such offence, forfeit and pay any sum not exceeding £5.

From and after the 31st day of October next, the Regulations under the Rabbit Nuisance Act of 1883, made by the Governor and Executive Council on the 17th day of April, 1885, shall be and the same are hereby repealed.

Form 1.

Rabbit Nuisance Act, 1883.

Authority by Inspector to Assistant.

To

You are hereby authorized as my Assistant, to enter upon any part of any of the lands mentioned in the Schedule below, at all reasonable hours, for the purpose of searching for and destroying rabbits.

Inspector.

Dated at , this day of 188 .

[Schedule referred to.]

Form 2.

Rabbit Nuisance Act, 1883.

Notice of Entry.

To

Take notice that it is my intention to enter [or that I have entered] upon of your land known as in the District of , for the purpose of searching for and destroying any rabbits there may be on such land.

Inspector,
or Assistant of Inspector.

Dated at , this day of , 188 .

Form 3.

Rabbit Nuisance Act, 1883.

Notice of intention to lay poison.

To

Take notice that it is my intention on or about the [dated] to lay on the portion of your land for the purpose of destroying rabbits.

Inspector,
or Assistant of Inspector.

Dated at this day of , 188 .

Form 4.

Rabbit Nuisance Act, 1883.

Certificate of Destruction.

I hereby certify that of* in Rabbit District No. delivered to me the skins of rabbits with scalps attached, destroyed within such holding. And I further certify that such skins and scalps, or scalps only, have been duly destroyed by me by fire as required by the Regulations under the abovenamed Act.

Inspector of Rabbits.

Dated at this day of 188 .

* Insert name and description of holding.

Form 5.

Rabbit Nuisance Act, 1883.

Owner's Journal.

Date.	No. of men employed	Names of men employed.	Whether employed every day in destroying rabbits; if not, the No of days so engaged.	On what part of holding employed and where camped.	Number of rabbit skins with scalps attached delivered.	Rate of bonus or wages paid.

Form 6.

Rabbit Nuisance Act, 1883.

Monthly Report by Owner.

Report of the men employed and sums paid for the destruction of rabbits by of during the month of , 188 .

1. The men employed.
   (1) The number.
   (2) Their names.
2. Whether employed every day destroying rabbits; and if not state the number of days so engaged.
3. On what portion of employer's holding at work, and where camped.
4. Number of rabbit skins and scalps delivered.
5. At what rate per skin paid if by bonus.
6. If by wages, the rate.
7. Total amount paid by owner during the month for destroying rabbits.
8. Any other information which it would be advantageous to give or to publish.

Form 7.

Rabbit Nuisance Act, 1883.

Application for Subsidy.

To the Honorable

The Minister for Mines, Sydney.

188 .

I, of being the owner of land known as in Rabbit District No. and more particularly described in the Schedule appended hereto, have the honor, in terms of section 18 of the abovenamed Act, to request that you will authorize the payment to me of the sum of £ as three-fourths of the total cost incurred by me up to the last, of exterminating the rabbits on such land,—as more particularly shown by the returns, vouchers, and receivers' certificates produced herewith by me, in proof of the work done and moneys expended in carrying out such extermination; and that you will pay the amount mentioned, or such other sum as you may deem right and proper to grant on my account, to

(*Signature*)

Form 8.

Rabbit Nuisance Act, 1883.

Notice to Inspector of the existence of Rabbits by the Owner of Land.

To Mr. Inspector Address

I hereby give you notice that there are rabbits on the portions of my land more particularly described in the Schedule below.

Schedule referred to.

Name of Land and Post Town.	Name of Owner.	Name of Paddocks infested.	Prevalence of Rabbits.	Area of each Paddock.

(*Signed*)
{ Owner, Manager, or
{ person in charge.

Dated at this day of 188 .

Form 9.

Rabbit Nuisance Act, 1883.

Appeal.

To the Honorable
The Minister for Mines, Sydney.

I, the undersigned, of in the Rabbit District No. feeling myself aggrieved by appeal against on the ground that and I respectfully request that an early day may be appointed by you for the hearing of this appeal.

(*Signature*)

Dated at
this day of 188

Sydney: Thomas Richards, Government Printer.—1885.

[3*d*.]

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

RABBIT NUISANCE ACT.

(PETITION FROM RUN-HOLDERS AND OTHERS IN THE WESTERN DIVISION OF NEW SOUTH WALES.)

Received by the Legislative Assembly, 17 *June*, 1886.

To the Honorable the Speaker and Members of the Legislative Assembly of New South Wales.

The humble Petition of the undersigned run-holders and others, resident in the Northern portion of the Western Division of New South Wales,—

RESPECTFULLY SHOWETH:—

That your Petitioners are threatened with an invasion of rabbits which are fast spreading in this direction from the south and south-west.

That much of the country in these districts is of a kind in which the rabbits are certain to increase rapidly, and that they are sure to become such a pest as to render the country almost if not wholly valueless.

That unless prompt measures are taken to check their spread, almost the whole of the Colony will inevitably become infested, and to such an extent in the back blocks, where the country is held in large areas, and everything is so favorable to their spread, that the country in all probability will have to be totally abandoned.

That your Petitioners strongly recommend rabbit-proof wire-netting fencing as the only means of preventing the uninfested country from becoming infested.

That the great majority of the run-holders in the uninfested country would, if they were exempted from the tax paid under the present Rabbit Act, be quite willing to be taxed to defray the cost of a line of rabbit-proof fencing judiciously placed to divide the infested from the uninfested country.

That the run-holders themselves are perfectly powerless to act in the matter without the assistance of Government, seeing that, even if there were no obstacles in the way of fencing off the infested country by private enterprise, no move could be made in the matter unless an Act of Parliament were passed, fixing the site for the fence and compelling those benefited by it to pay towards its cost.

That the cost of the fence would be comparatively trifling, seeing that many boundary fences of runs at present in existence could be utilized to fix the wire-netting on, and a great saving in the cost of construction be thereby effected.

That your Petitioners earnestly pray that the proposal to erect rabbit-proof fencing along the Railway Line to Bourke be immediately carried out, and that the fence be continued from Bourke west, or a little south of west, to the South Australian border, and north along it to the Queensland border, where it would join the rabbit-proof fence now being constructed by the Government of that Colony.

And your Petitioners, as in duty bound, will ever pray.

[*Here follow* 52 *signatures.*]

1885-6.

NEW SOUTH WALES.

PUBLIC WATERING-PLACES ACT, 1884.

(AMENDED REGULATIONS UNDER.)

Presented to Parliament by Command.

Department of Mines,
Public Watering-places Branch,
Sydney, 1st December, 1885.

PUBLIC WATERING-PLACES ACT OF 1884.

THE following Regulations made by His Excellency the Governor, with the advice of the Executive Council, for the purpose of carrying out the abovenamed Act and of regulating the Management, Maintenance, and Control of Watering-places, are hereby published for general information, in lieu of those published on the 28th April, 1885, which are hereby cancelled from 1st January, 1886.

GEO. THORNTON.

GENERAL.

1. All water within the area of any Public Watering-place, except that lying within the limits of any Public Road, shall be held to belong to such Public Watering-place; and any person using such water shall pay on demand to the tenant or caretaker of such Public Watering-place, the authorized charges.

2. Inspectors and Overseers of Public Watering-places and other persons appointed under the abovenamed Act, or any person acting under the authority of the Minister for Mines, shall have free ingress and egress to and from any Public Watering-place, and access to any appliance or appurtenance thereon, and to the books and papers relating thereto, and may also when necessary examine and test the machinery and appliances at such Public Watering-places, and with that view the tenant or caretaker in charge thereof shall, when called upon, supply, as the case may be, the necessary steam, horse, or manual power, and provide such tools and implements as may be required to make such test or examination.

RULES OF WATERING.

3. No stock, except travelling stock in charge of a drover supplied with a travelling statement or permit (as required by the Act 41 Vic. No. 19, or by any Act amending or repealing the same), or teams and horses used by travellers, shall be supplied with water by the tenant or caretaker; but the tenant may water not more than thirty head of his own stock.

4. Drovers, to ensure prompt supply, should give six hours notice to the tenant or caretaker of their intention to water at a Public Watering-place. Any person requiring water shall, on the request of the tenant or caretaker, render every assistance to enable him to supply water safely and promptly.

5. In order that the water be kept free from pollution no stock shall be allowed to camp in such a position that their droppings will be carried into the water. And the carcasses of all stock dying in the neighbourhood of a Public Watering-place shall be removed and burnt by the drover or owner of such stock.

6. Tenants and caretakers shall make all arrangements necessary for the safety and convenience of stock watering, and shall always keep the supply tank full.

7. All travelling stock shall be promptly supplied with water in the order of their arrival at a Public Watering-place upon prepayment of the authorized charges. Working horses and working cattle shall be served before travelling stock.

WATERING CHARGES.

8. All persons in the Public Service, including the Police, shall be allowed water for their horses free of charge, upon the tenant or caretaker being satisfied of the position or occupation of such persons.

9. The charges for water which the tenant or caretaker shall collect, are as follows:—

	s.	d.
Horses per head	0	2
Cattle ,, ...	0	1
Sheep per hundred or portion of hundred	1	0

Any other animals according to agreement between the tenant or caretaker and the owner or drover.

10. Horses belonging to mail contractors running over the road near which a Public Watering-place is situated shall be charged one-half of the above rates.

11. Horses belonging to any coach proprietor used in coaches running regularly over such road, other than those of the mail contractor, shall be entitled to water at the authorized rates at all Public Watering-places near such road.

12. A copy of the scale of charges, with the name of the Watering-place and of the tenant or caretaker attached, shall be placed in a conspicuous position and maintained in a clear and legible condition.

SALES OF LEASE BY AUCTION.

13. Where it is desired to offer the lease of a Public Watering-place for sale by public auction, such sale shall be held at a time and place and by such licensed auctioneer as may be appointed by the Minister.

14. A sealed envelope containing the upset price reserved by the Minister for the lease of the Public Watering-place to be offered shall be forwarded to the auctioneer previous to the sale of such Watering-place; and such envelope shall only be opened upon the lease of such Watering-place having been knocked down by the auctioneer to the person making the highest bid.

15. If such person's bid be found equal to or exceed the upset price, he shall be declared the purchaser, and shall, subject to the stipulations and conditions set forth in these Regulations be held and deemed to be the tenant of the Public Watering-place for which his bid shall have been made, provided he shall thereupon pay to the Auctioneer a deposit of £5 sterling.

16. Should any dispute arise between the bidders, or between the bidders and the seller, previous to the name of the highest bidder being declared as aforesaid, the lease shall be then and there put up again by auction.

17. The purchaser and his sureties shall be present at such auction, or if unable to be present, shall have a person duly authorized in that behalf to represent him and them thereat, whose signature shall be binding on the purchaser and his sureties.

18. Should the lease of any Public Watering-place not be disposed of by auction, it may be disposed of by tender or otherwise, as the Minister shall direct.

Tenders for Public Watering-places.

19. A separate tender shall be made for the lease of each Public Watering-place, and shall be sealed and endorsed "Tender for Public Watering-place."

20. Every such tender shall be placed by the tenderer or his agent in a box kept for that purpose at the office of the Minister; and any tender transmitted by post shall be forthwith placed in such box unopened.

21. Every tender shall be accompanied, under the same envelope, by a Bank draft for £5, or by a receipt showing that that sum has been deposited in the Colonial Treasury; and in the event of the ultimate acceptance of the tender the tenderer shall receive credit for the amount of such payment or deposit in the rent; and in the event of the tender being rejected the amount shall be returned to the tenderer.

22. The Tender Board appointed for that purpose shall open the tender box at noon on the first Tuesday after the date fixed for tenders to be sent in, and all tenders found in the box shall be recorded by the Board.

23. Neither the highest nor any tender shall necessarily be accepted, and fresh tenders may at any time be called for, as the Minister shall direct.

24. Upon the tender for a lease of a Public Watering-place being accepted the acceptance shall be notified in the Gazette, and the tenderer shall thereupon be held to be the tenant of such Public Watering-place, but subject to all the conditions and stipulations contained in these Regulations.

Conditions of Lease.

25. The lease of a Public Watering-place shall confer upon the tenant the right to collect and retain the charges authorized at such Watering-place, and the right of agistment within the leased area.

26. No lease shall confer any right to purchase in virtue of improvements or otherwise any land comprised within the lease.

27. The tenant and two sureties resident in the Colony, approved by the Minister, shall, when called upon, execute a lease and enter into a bond, in a sum equal to two years rent of such Public Watering-place, to secure the due payment of the rent, and for the due fulfilment by him of all the stipulations and conditions of these Regulations and of the provisions of the abovenamed Act.

28. The rent of such Public Watering-place shall be paid to the Colonial Treasurer, at Sydney, in equal quarterly instalments in advance, and if not paid within ten days after the same falls due each instalment shall bear interest, at the rate of eight pounds per centum per annum, from the day of default until paid; and if the rent be not paid when due, the Minister may direct an officer to take possession of such Public Watering-place and collect the charges payable thereat, without prejudice to any right to cancel the lease, or to enforce any claim against the lessee hereunder.

29. The tenant, on payment of the first quarter's rent in advance will receive notice to attend at the Public Watering-place for which his offer has been accepted; and if, after receiving such notice, he fail to attend and take delivery as requested, a caretaker shall be engaged for such Watering-place at his risk and expense, and his deposit shall be forfeited.

30. If the tenant of a Public Watering-place fail for more than thirty days after the date of his purchase, or of the notice of the acceptance of his tender, to attend and take delivery of such Watering-place, the Minister may cancel the lease, and cause the same to be put up for lease by auction or let by tender, and the tenant and his sureties shall be liable for all loss or damage which may be incurred, and all costs, charges, and expenses entailed thereby; and the amount of such loss, damages, costs, charges, and expenses may be recovered from the tenant and his sureties, as provided by the Act or the Regulations thereunder.

31. If the tenant attend according to notice a statement of the works, appliances, and appurtenances at the Public Watering-place, and of the state and condition thereof at the time they are handed over to him, shall be prepared in duplicate, and shall be signed by the tenant and the officer delivering the works over to him, as an acknowledgment of the condition and state thereof, and one copy of such statement shall be retained by the tenant and the other by such officer.

32. At the termination of the lease the tenant shall surrender to the overseer, or such other person as the Minister shall authorize in that behalf, the works, appliances, and appurtenances leased to him, in the same good order and condition, reasonable wear and tear excepted, in which they were received by such tenant; and if the works, appliances, or appurtenances so surrendered be then such as to require repairs the tenant shall pay to the Colonial Treasurer the cost of such repairs.

33. The lease shall be liable to forfeiture upon the breach or failure of any of these conditions; the fact of such breach or failure shall be determined by the Minister.

34. The lease of any Public Watering-place shall be liable to forfeiture upon the rent being in arrear, or if the tenant shall become insolvent, or if he shall assign his estate for the benefit of his creditors; or upon his conviction of illicit traffic in liquor, or of keeping a disorderly house, or of harbouring improper characters, or other offences against the Vagrant Act,—the tenant and his sureties being liable for any loss arising from the re-letting of such Public Watering-place.

35. No sub-letting nor transfer of lease of a Public Watering-place will be permitted without the sanction of the Minister.

36. Should the tenant desire to renew his lease, he must give the Minister three (3) months' notice of such desire.

37. The tenant of a Public Watering-place shall, during his lease, keep the works, buildings, fences, gates, gauges, drains, inlets, valves, pipes, embankments, approaches, and all machinery, appliances, and appurtenances thereto belonging, in good order, repair, and condition.

38. Upon receipt of notice from the Inspector or Overseer, the tenant shall forthwith make any necessary repairs; and if he fail to do so within fourteen days after the receipt of such notice, they may be made by order of that officer, or of any officer appointed by the Minister in that behalf, at the tenant's expense; and the payment of the cost of such repairs by the tenant or his sureties shall be enforced, as provided by these Regulations.

39. Every precaution shall be taken by the tenant during floods to prevent injury or damage to the Public Watering-place, its appliances, or appurtenances under lease to him, and he shall be liable for all loss and injury caused by negligence in any such case.

40. No remission of rent will be allowed on account of damage by flood or otherwise.

41. The tenant shall be accountable for the proper conduct and be responsible for the acts of his employees, one of whom shall always be in attendance at the Watering-place.

42. A book, which will be supplied for the purpose, shall be kept by the tenant, containing an exact statement of all stock watered, and such book shall be open at all times for the inspection of the Inspectors and Overseers of Public Watering-places or any other officer authorised by the Minister.

43. The tenant must forward to the Chief Inspector of Public Watering-places, Sydney, at the end of each week, upon forms which will be supplied, a statement of the depth of water, as shown by the gauge in a tank or dam, or by sounding in a well, and such other particulars as may be required.

44. The Minister may dismiss any agent or caretaker appointed by the tenant, whom he considers unfit for the charge of the works.

45. The tenants of Public Watering-places must keep copies of the Watering-places Act and any Regulations issued thereunder, which they shall produce when asked for by any person requiring water.

46. Should the Minister decide to repair or alter any tank, dam, or well, or any appliance or appurtenance thereof the tenant shall, on receiving seven days' notice, allow and permit such repairs or alterations to be promptly and fully carried out.

47. The tenant or his agent shall reside in the immediate neighbourhood of the Public Watering-place.

48. If the Minister considers such a course necessary he may, on giving the tenant three months' notice, cancel any lease granted hereunder, and the tenant shall have no claim for compensation on account of such cancellation.

WATER TRUSTS.

49. Any Public Watering-place may be placed under Tru stees, subject to these Regulations and the following conditions:—

1. The number of Trustees may be three or five as the Minister shall decide.
2. The Trustees must engage and may discharge a caretaker who will be under their immediate control and direction, but his remuneration will be fixed and paid by the Government.
3. The Trustees shall see that the works, appliances, and appurtenances are kept in a thoroughly efficient state, and will, as the necessity arises, make requisition to the Minister for repairs.
4. Persons residing within certain limits, to be fixed in each case by the Minister, will be entitled to obtain water from any Public Watering-place under Trustees for domestic purposes, free of charge, and for stock at the following charges, namely:—

	s.	d.
Horses, per head	0	0½
Cattle and Goats, per head	0	0¼
Sheep, per hundred, or portion of a hundred	0	6

Any other animals according to agreement with the Trustees.

5. All travellers, teamsters, and drovers entitled to obtain water at a Public Watering-place shall, on pre-payment of the charges prescribed by Regulation No. 9, be equally entitled at Public Watering-places under Trustees.
6. All watering charges collected at Public Watering-places under the control of Trustees shall be paid into the Consolidated Revenue Fund.

FORFEITURES AND PENALTIES.

50. No person shall, except at the request of the tenant, caretaker, or proper officer, interfere with the machinery or appliances of a Public Watering-place, and no person shall allow his stock to water except where directed by the tenant or caretaker.

51. The tenant shall not, under pain of forfeiture of his lease, allow stock to be admitted to the main or conserving tank.

52. All persons are prohibited taking water from a Public Watering-place without pre-payment of the charges, or without the consent of the caretaker, tenant, or the person for the time being in charge. And all persons so doing are liable to prosecution for the recovery of the authorized charges, and for all penalties incurred for breach of the Regulations, under Clause 16 of the Act.

53. If any person other than a tenant, caretaker, or trustee shall violate or neglect any of the foregoing Regulations for which a penalty is not provided for by the Act, such person shall, on conviction for every such offence, be liable to a penalty not exceeding £2.

Sydney: Thomas Richards, Government Printer.—1886.

[3*d*.]

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

PRICKLY PEAR DESTRUCTION BILL.

(MESSAGE No. 24.)

Ordered by the Legislative Assembly to be printed, 25 *May*, 1886.

CARRINGTON,
Governor.

Message No. 24.

In accordance with the provisions contained in the 54th section of the Constitution Act, the Governor recommends for the consideration of the Legislative Assembly the expediency of making provision to meet the requisite expenses in connection with a Bill to provide for the eradication of the Prickly Pear.

Government House,
Sydney, 2 *April*, 1886.

[34] 502—

1885-6.

NEW SOUTH WALES.

PRICKLY-PEAR DESTRUCTION ACT OF 1886.

(REGULATIONS UNDER.)

Presented to Parliament, pursuant to Act.

Department of Mines, Forest Branch,
Sydney, 6th October, 1886.

THE PRICKLY-PEAR DESTRUCTION ACT OF 1886.

His Excellency the Governor, with the advice of the Executive Council, has been pleased to make the following Regulations under the abovenamed Act, which are hereby published for general information.

JAMES FLETCHER.

Notices by Owners or Occupiers to Inspectors.

1. All notices by owners or occupiers to Inspectors of Prickly-pear being on such owners or occupier's land, or to attend and ascertain whether there is Prickly-pear on their land, shall be to the effect of Form 1 hereto.

Clearing Leases of Land infested with Prickly-pear.

2. The Minister may, pursuant to the above-cited Act, fix a minimum rent, and offer at auction, or may invite tenders for leases, subject to the following conditions and covenants, that is to say:—

(I.) That the rent shall be paid annually in advance.

(II.) That the Lessee and two sureties, resident in the Colony, and to be approved by the Minister, shall enter into a bond for such an amount as the Minister shall direct for the due fulfilment of the conditions and covenants of the lease.

(III.) That the Lessee will not assign, sublet, or subdivide the land demised without the consent of the Minister signified in writing.

(IV.) That the Lessee shall within the period named in the lease commence to eradicate from the land demised all Prickly-pear growing thereon, and shall for that purpose employ the number of men specified in the lease, and that the Lessee shall keep the land free from Prickly-pear to the satisfaction of the Minister during the term of such lease: Provided that the Minister may at any time permit the lessee to suspend the work of clearing or to employ fewer men than the specified number, upon being satisfied that such suspension of work or reduction of men is absolutely necessary.

(V.) That the Lessee shall at the expiration of the term for which his lease is granted, surrender the demised land, and give peaceable and quiet possession thereof to the Minister, or to any person authorized by him.

(VI.) That the Lessee shall keep in good condition and repair during the continuance of the term of his lease, all houses, fences, wells, reservoirs, tanks, dams, and all other improvements of a permanent character on the land demised, whether erected, constructed, or made by such Lessee or otherwise; and on receipt of notice from the Minister to repair any damage done to any such improvements, the Lessee shall forthwith repair the same.

(VII.) That the lease shall be expressed to be voidable if, in the opinion of the Minister, the Lessee shall have committed any breach of, or shall have failed to comply with, any of the conditions or covenants of the lease.

(VIII.) That the Minister may at any time cancel any lease if the demised land or any part thereof be required for any public purpose, but subject to payment of compensation to the Lessee for any loss he may sustain by reason of his lease being cancelled, and the amount of such compensation shall be determined by arbitration, as provided by the Act 35 Victoria No. 15.

(IX.) That the Lessee shall have the right of ingress, egress, and regress to and from the land comprised in his lease, through and over any land lying between the demised land and the nearest public road or track.

(X.) That the Minister, or any person authorized by him in that behalf, may at any time enter upon the demised land to ascertain whether the conditions and covenants in any such lease are being duly performed by the Lessee.

(XI.) That if the Lessee shall with the consent of the Minister, signified in writing, erect or construct on any part of the land comprised in his lease any houses, fences, wells, reservoirs, tanks, dams, or other improvements of a permanent character, he shall on the resumption under the authority of these Regulations, or at the expiration of the term of such lease, be entitled to demand and recover from the Minister the full value of such improvements erected during the term of his lease: But the sum to be paid shall not exceed the sum expended thereon, which shall be ascertained as provided by No. VIII. hereof.

(XII.) In any case in which it shall appear to the Minister proper so to do, he may insert special conditions in a lease.

Clearing Roads of Prickly-pear.

3. If a road divides the land of two owners or occupiers, and if there is Prickly-pear upon such road, each of such owners or occupiers shall eradicate the Prickly-pear on the half of the road bounding his land; and if either of such owners or occupiers shall have cleared his portion of such road, and the

C3

other owner shall have failed to clear his portion, the first-mentioned owner or occupier may give the second-mentioned owner or occupier notice to the effect of Form 2 hereto to clear his portion within a reasonable time, to be specified in such notice; and if such last-mentioned owner or occupier shall not comply with such notice within the time specified, the first-mentioned owner or occupier may clear the whole width of such road and may sue for and recover from the defaulting owner or occupier the cost of eradicating the Prickly-pear on the half of the road bounding such defaulting owner or occupier's land.

FORM 1.

Prickly-pear Destruction Act of 1886.

Notice to Inspector of existence of Prickly-pear.

To Mr.

Prickly-pear Inspector,

I hereby give you notice that (*or* to attend and ascertain if) Prickly-pear is to be found on portions of the land more particularly described in the Schedule below.

[Schedule referred to above.]

Land District Sheep District
County parish lot area
Area infested (or suspected of being infested)
Name and address of owner
Name and address of person in charge
Description and boundaries such as will lead to the identification of infested land.

Signature (owner or person in charge),

Dated at this day of 188 .

FORM 2.

Prickly-pear Destruction Act of 1886.

Notice by owner to defaulting owner to clear road

To

You are hereby required in terms of Regulation 3 under the abovenamed Act to eradicate the Prickly-pear on the half of the road (bounding the land of which you are the owner or occupier) from to of Prickly-pear, on or before the and I hereby give you notice that if the Prickly-pear is not eradicted on the portion of the road specified within the time mentioned, the work will be carried out at your expense.

Dated at , this day of , 188

Sydney: Thomas Richards, Government Printer.—1886.

[3*d*.]

1885.
(THIRD SESSION.)

NEW SOUTH WALES

FOREST BRANCH, DEPARTMENT OF MINES.

(ANNUAL REPORT.)

Printed in accordance with Resolutions of both Houses of Parliament.

To the Honorable Joseph Palmer Abbott, Esq., M.P., &c., Minister for Mines.

Sir,

I have the honor to submit herewith the reports upon the working of the Forest Branch during the year 1884, furnished by the Inspector of Forests and the Chief Clerk of the Branch respectively.

I am happy to state that the work in the Head Office under the direction of Mr. W. F. Piper, the Chief Clerk, was satisfactorily performed during the year, notwithstanding the large increase of business. The Forest Rangers, who are also under the direction of the Chief Clerk, performed their duties creditably.

Care was taken as far as practicable to preserve for purposes of timber supply such areas of land in various parts of the Colony as will provide supplies equal to future demands, and in the most convenient positions; but in view of the growing demand and the rapidly-failing supply of the timbers most in demand the adoption of stringent measures for the suppression of waste is an urgent necessity, though any measures in that direction are sure to invoke the hostility of a certain class of persons who have long been accustomed to fell valuable trees without let or hindrance, and who have exercised the privilege, not always because they required to use the tree felled, but to prevent a competitor from getting possession of it. It is to be hoped that these people will see that efforts to prevent wasteful destruction of valuable timber trees are really made in the interest of timber getters and dealers as well as for the public benefit.

Under the operation of the Ringbarking Act an enormous number of trees have been and will of necessity be destroyed; and, doubtless, in spite of the efforts of the Officers of this Department to restrict ringbarking to trees of the least valuable description, large numbers of valuable trees have been and will be thus destroyed; and though we may fairly anticipate that the improved growth of grass will amply compensate for the waste of timber, still the knowledge that such large quantities of timber are being destroyed renders more imperative the duty devolving upon the Department of preserving our timber supply by thinning out and otherwise improving and protecting our existing forests.

It is to be regretted that, owing to the drought and the unsuitability of the sites selected, the wattle plantations formed along the railway line have not proved a success.

The plantations of catalpa, walnut, and cedar, formed under the supervision of the Inspector of Forests (Mr. John Duff), are in a promising condition. Mr. Duff is making preparations for establishing nurseries for the propagation of the best kinds of timber trees. The principal one is to be established near Gosford, where indigenous and foreign timber trees will be propagated for planting in forest and other approved reserves; the other will be established in the interior of the Colony, mainly for the purpose of testing the kinds of trees best adapted to thrive in the dry districts.

Much attention has been given by the Inspector of Forests to collecting information concerning some of the valuable timbers of this Colony hitherto not much known or used. I anticipate that the Inspector, with the valuable aid of Mr. Forest Ranger Rudder, will be able ere long to furnish much useful information concerning the habitat, uses, extent of supply, and cost of procuring timbers possessing special economic value.

I regret that the progress made in regard to the work on the Forest Flora of this Colony has been so slow, but I am convinced that the Inspector of Forests is doing all in his power to complete for publication the first number.

Appended hereto is the report furnished by Dr. R. von Lendenfeld upon the insect which destroys pine scrub in certain districts.

I have, &c.,
HARRIE WOOD,
Under Secretary for Mines.

Department of Mines,
Sydney, 21 July, 1885.

[1298 copies—Approximate Cost of Printing (labour and material), £80 13s. 9d.]

Report from the Chief Clerk, Forest Conservancy Branch, to The Under Secretary for Mines.

Sir, Forest Conservancy Branch, Sydney, 27 May, 1885.

I have the honor to submit a report for the year 1884 upon the work performed by this Branch of the Department.

The Staff.

The staff employed, together with the date each officer entered the Department, and the salary paid, are shown on Schedule A.

During the year thirty-eight Forest Rangers and Assistant Rangers in the field have travelled 177,935 miles on duty in inspecting Forest Reserves and Crown Lands; much of this travelling was in connection with reporting upon applications for permission to ringbark timber, four Rangers alone having travelled 25,988 miles almost exclusively upon this work.

Two Rangers and two Assistant Rangers were appointed to fill vacancies caused by resignation or dismissal.

Revenue and Expenditure.

Appended are schedules showing revenue for year 1884	Schedule B.
Expenditure do do 1884	do C.
Details of revenue from specified Reserves	do D.
Comparative statement of revenue and expenditure for each year from 1877 to 1884	do E.
Particulars of prosecutions by Forest Rangers for illegally cutting timber, and penalties inflicted, 1884	do F.

The revenue again shows a considerable increase, the amount, £18,250 5s. 8d., being over four times that received for the year 1877.

As in the years 1882 and 1883, a large proportion of the expenditure has been incurred in connection with ringbarking duty.

Reserves and Timber.

Appended are schedules showing the following particulars:—

Summary of number and area of Timber Reserves	Schedule G.
Distribution of Reserves amongst Forest Rangers	do H.
Details of area of Reserves and particulars of the timber	do J.
Timber Reserves proclaimed as exempted from the operation of ordinary timber licenses, issued under the Regulations of 24th September, 1878	do K.
Other Reserves and Crown Lands proclaimed exempted from the operation of ordinary timber licenses	do L.

The total area reserved for preservation of timber supply is estimated at 5,390,513 acres, or about $2\frac{1}{10}$ per cent. of the area of the Colony.

This is not by any means too large a proportion, as the tendency, especially in the Central Division of the Colony, is to destroy nearly all timber, so that the land may produce a greater growth of grass; for instance, in the County of Denison, where, in 1882, 83 per cent. of the land had been alienated from the Crown, Ranger Manton reports, "That, with the exception of the Forest Reserves, a few strips along the Travelling Stock Reserves, and small portions of Water Reserves, all the timber in the county has been ringbarked." The area reserved for preservation of timber supply in this county is 39,492 acres.

Again, reporting generally on the districts adjoining the river Murray, in the Central Division, where a very large proportion of the land has been alienated, Mr. Manton writes: "In a very short time there will be no Crown Lands (excepting the reserves) in this district, and as previously stated, alienation of the land means utter destruction of the natural forests; even at the present time there is very little living timber to be seen excepting on reserves, and it may become necessary ere long to plant," *i.e.*, to plant portions of reserves not now containing valuable timber. The total area reserved for timber supply in the district referred to is estimated at 461,431 acres, the greater part low-lying and subject to inundation upon the snow water from the mountains reaching the plains. The soil is generally a poor black clay, very adhesive when wet, with occasional low ridges of apparently wind-blown sand. With the progress of settlement many of the timber reserves, especially those in the Central Division, will be valuable, if only to preserve a certain proportion of timbered country, irrespective of any other economic value the timber may have, as in most cases after ringbarking country the increase in the growth and quality of the grass is so marked, and the immediate profit so great, that the trees are destroyed without any other consideration.

Upon the reserves worked under Forest License 14,569,035 feet of timber have been cut, besides 293 trees felled for special purposes; the royalty and license fees amounted to £8,392 8s. 10d.

Nearly all the matured pine in the Central Murray District has been cut out. Anything like an approximate estimate of the quantity of timber felled throughout the Colony would be difficult to arrive at. The available records show the quantities shipped from ports or shipping places along the coast to be 58,267,350 superficial feet, 5,331 piles, 1,539 girders, 4,849 logs, 2,341 pieces, 13,492 spokes, 2,213,000 laths, 498,000 palings, 53,547 felloes, besides naves, posts and rails, and shingles; this does not include timber shipped from the Gosford, Macleay River, and Hawkesbury River Districts, these returns not having been furnished, nor the timber shipped from Sydney and Newcastle.

From the Richmond River alone, deducting the quantity of timber cut on reserves under Forest License, 13,698,181 superficial feet, 4,849 logs, and 2,341 pieces were shipped, while the fees for Timber Licenses amounted to only £588 10s. It is, however, reported that a large proportion is cut upon freehold land, much of it conditionally purchased solely for the value of the timber.

It is, however, obvious that the total quantity shipped is understated, the returns from Port Stephens, whence the timber from the extensive forests around the Myall River and Lake is shipped, being given as only 54,734 superficial feet, besides 1,196 piles, 1,539 girders, and 950 spokes, while the total quantity cut at 6 mills in that locality is about 5,577,120 feet per annum.

The trade generally appears to be confined to a few well-known species of timber, others being neglected because they are somewhat hard or difficult to cut. Without doubt many of the indigenous timbers might be more largely utilized for purposes for which they are now scarcely used.

Mr.

Mr. Henry Bonnard, the Executive Secretary for this Colony at the Bourdeaux Exhibition of 1882, in his report, page 18, after drawing attention to the fact that wine-casks for a large firm on the Douro are made from timber mostly imported from the United States or northern parts of America, writes:—"With respect to these, Mr. Tait, a British gentleman, who is manager of a cask steam manufactory at Oporto, and his brother, a wine and spirit broker there, mentioned the somewhat astonishing fact that they were growing forests of Australian gum-trees in the south of Portugal for no other purpose than utilizing them for the making of casks. They said that they had already tried and found them of good service, in no way injurious to the new wines if the staves have been previously steamed. They wondered at Australian industry not having found this out long before, and made use of it for the shipment of Colonial wine. The main condition to be observed in the selection of the timber is that the trees must grow very straight up, and they do take great care to secure this end on their southern plantations. I recollected then my first impression in entering Portugal, coming from Madrid. It was 1 o'clock in the morning when the train reached the Portuguese border town, and being awoke by the stoppage and noise of the Customs officers rummaging the train, I landed on the platform, when for a few seconds I wondered if I was not in Australia, for the trees overhanging the railway premises were all gum-trees, with their usual strong smell, whilst the primitive station-buildings were the same as those to be seen here in the up-country districts. This impression was a particularly pleasant and agreeable one, bringing to my mind recollections of my adopted and distant land. It was therefore with great pleasure that I heard the practical and useful discovery made by the Oporto people, from whom I learned also that a short time before me a representative of South Australia, Mr. T. Hardy, wine-grower, had also visited the district for the same purpose as myself.

"Messrs. Tait were so good as to promise to ship to Sydney a cask made of eucalyptus timber, so as to help me in convincing Colonial people of a fact which could otherwise be reasonably doubted, owing to the peculiar botanical constitution of the wood, which, in the opinion of most men, would justify it, discarding for such purposes as wine-cask making. Whenever this cask arrives I intend leaving it in the Technological Museum of Sydney, that it might be seen and inspected by all interested."

The mountain ash, growing on the Bago forest reserve, counties of Selwyn and Wynyard, appears to possess the qualities required, this timber having been used several years previously by one of the vignerons of Albury for making casks holding some 2,000 or 3,000 gallons; it was pointed out in the annual report of the Occupation Branch for 1880, Schedule 7, that it was likely there would be a large demand for the purpose.

Scrubbing and Thinning Reserves.

During 1884 permission has been granted to clear scrub and thin out saplings on five forest reserves, area 57,250 acres, and on 26,710 acres of other reserves and lands.

Permission to thin out timber on reserves is made subject to the condition that an officer should constantly supervise the work; this is necessary, because while it is the object of the Department to improve the growth of timber, the aim of the lessee is to clear away as much as he can so as to secure as large a growth of grass as possible. If trees and saplings are left at too great a distance apart they become branchy and produce inferior timber, and injury may be caused in a few days by injudicious thinning, which could not be remedied for many years.

During the year work has proceeded on seven reserves, and 7,065 acres have been done to the satisfaction of the officers supervising the thinning.

The dry season, heavy cost of labour, and uncertainty respecting the land law, appear to have militated against a larger area being operated upon.

Ringbarking.

Schedule M shows in tabulated form particulars of applications for permission to ringbark timber on lands held under five years' pastoral lease.

197 applications were finally dealt with, permission being granted in 155 cases, for an area of 1,207,537 acres, making the total area granted under the Ringbarking on Crown Lands Regulation Act of 1881, 3,861,108 acres. This is exclusive of applications for permission to ringbark on lands held under annual lease, dealt with by the Department of Lands; during the year 163 such applications were reported upon by the Forest Rangers.

Generally the restrictions attached to the permissions were well observed by the lessees, but in six cases the authorities have been cancelled for breach of conditions. In other cases, where it appeared proper steps were not being taken to have the work carefully done, the lessees were warned.

Cedar, Catalpa, and Wattle Plantations.

The expenditure on this work is given on Schedule C. Further particulars will be given by the Inspector of Forests, under whose immediate direction the work was done.

Office.

During the year the following papers were received and despatched:—

Papers Registered.	Papers Despatched.
10,829, exclusive of 880 timber license returns.	Manuscript letters, 4,210 Letters on Printed forms, 1,934. Blank-cover communications, 2,150.

County Maps.

Maps of thirty-eight counties, showing the Forest Reserves, and, as far as practicable, the land for hich permission to ringbark timber has been granted by this Department, have been prepared.

W. F. PIPER,
Chief Clerk.

SCHEDULE A.

SCHEDULE A.

FOREST BRANCH.—Officers employed in 1884.

Name.	Date of entering Department.	Rank.	Salary.	Amount actually received for the year.	Total.
			£	£ s. d.	£ s. d.
W. F. Piper	1 May, 1863	Chief Clerk	300	300 0 0	300 0 0
A. A. Daniel	4 Feb., 1875	Clerk	200	200 0 0	
C. H. Bennett	5 Aug., 1879	,,	150	150 0 0	
W. C. Hinwood	1 April, 1882	,,	150	150 0 0	
J. R. Bell	10 Mar., 1881	,,	150		
J. R. Bell	10 Mar., 1881	Temporary Clerk	from 1 Dec., 10s. per diem.	157 0 0	
(Promoted See above.)					
A. S. Podmore	May, 1884	,,	,,	86 10 0	743 10 0
John Duff	1 Dec., 1882	Inspector of Forests	350	350 0 0	350 0 0
J. A. Manton	22 Sept., 1875	Forest Ranger	250	250 0 0	
J. Noake	11 Oct., 1875	,,	200	200 0 0	
T. H. Green	1 Jan., 1876	,,	200	200 0 0	
W. Allen	1 Mar., 1876	,,	200	200 0 0	
S. Payten	21 Sept., 1876	,,	200	200 0 0	
J. G. Condell	1 Oct., 1876	,,	200	200 0 0	
R. Stevenson	14 Mar., 1877	,,	200	200 0 0	
O. Wilshire	12 Oct., 1877	,,	200	200 0 0	
J. S. Allan	20 Mar., 1879	,,	200	200 0 0	
E. Higgens	9 Sept., 1879	,,	200	200 0 0	
T. W. Wilson	1 Oct., 1879	,,	200	200 0 0	
G. R. Brown	1 Mar., 1882	,,	200	200 0 0	
E. J. Deverell	1 Mar., 1882	,,	200	200 0 0	
T. M. Evans	1 Mar, 1882	,,	200	200 0 0	
J. Martin	1 Mar., 1882	,,	200	200 0 0	
M. Meredith	1 Mar, 1882	,,	200	200 0 0	
F. P. Huxham	1 Mar., 1882	,,	200	200 0 0	
H. O. Rotton	1 Mar., 1882	,,	200	200 0 0	
R. L. Siddins	1 Mar., 1882	,,	200	200 0 0	
J. S. Taylor	1 Mar., 1882	,,	200	200 0 0	
G. W. West	1 Mar., 1882	,,	200	200 0 0	
T. White	18 Sept., 1882	,,	200	200 0 0	
P. Cullen	1 Mar., 1883	,,	200	200 0 0	
E. Cobcroft	1 July, 1883	,,	200	200 0 0	
T. Kidston	1 July, 1883	,,	200	200 0 0	
W. Mecham	1 July, 1883	,,	200	200 0 0	
H. S. Shadforth	1 July, 1883	,,	200	200 0 0	
J. S. Cheesbrough	1 Aug., 1883	,,	200	200 0 0	
J. Guilfoyle	1 Dec., 1883	,,	200	200 0 0	
S. W. Daniel	1 Jan., 1884	,,	200	47 6 2	
succeeded by	to 31 May, 1884				
T. H. B. M'Gee	From 1 July, 1884	,,	200	100 0 0	
A. K. M'Kenzie		Temporary Forest Ranger.	200	13 4 4	
R. J. Cork	11 May, 1877	Assistant Forest Ranger	175	175 0 0	
F. M. C. Forster	1 April, 1876	,,	150	150 0 0	
J. Ward	19 Mar., 1877	,,	150	150 0 0	
T. Musgrave	1 Jan., 1879	,,	150	150 0 0	
F. E. Brunker	1 July, 1883	,,	150	150 0 0	
W. Cousins	1 July, 1883	,,	150	150 0 0	
W. MacDonald	1 July, 1883	,,	150	150 0 0	
G. King	16 Nov., 1883	,,	150	150 0 0	
W. Byron	1 Jan., 1884	,,	150	150 0 0	
J. B. Ryall	17 Dec., 1879	,,	150	62 10 0	
succeeded by					
J. G. Postlethwaite	1 July, 1884	,,	150	75 0 0	
A. Rudder	20 Aug., 1884	Acting Assistant Forest Ranger	150	55 5 5	3,728 5 11
H. D. Wood	9 Aug., 1883	Junior Forest Ranger	75 to 31 January. £87 10 to 31 July. £100 from 1 August.	91 13 4	
T. F. C. Binny	9 Aug., 1883	,,	,,	91 13 4	
C. Stevens		Acting Forest Ranger.	30	30 0 0	
J. Robbins		,,	30	30 0 0	
R. O'Connell	1 Dec., 1884	Forest Ranger	15	1 5 0	
J. Russell.		Engineer, steam-launch "Neptune."	£10 per month	120 0 0	
C. Clark		Woodcutter	5s. per diem.	91 10 0	
Messenger			100	93 16 4	
J. Wilson		Caretaker of Reserves	10s. per diem when employed		
S. Kermode To 31st March, 1884		,,	,,		549 18 0
					9,521 13 11

SCHEDULE B.

PARTICULARS of Revenue—Year ending 31st December, 1884.

	£ s. d.	£ s. d.
Reserves exempted by proclamation from ordinary timber licenses—		
State forest block licenses	1,334 3 10	
Sub-licenses	155 0 0	
Forest—26th Regulation	14 10 0	
,, 27th ,,	319 0 0	
,, 45th ,, issued under Executive authority, with an additional charge for royalty	78 0 0	
Forest—Issued under Executive authority, without any additional charge for royalty	350 5 0	
		2,250 18 10
Royalty—		
At per 100 superficial feet, cut under block license	4,764 2 6	
,, tree, cut under 26th Regulation	18 10 0	
,, 100 superficial feet, cut under 27th Regulation	1,021 6 11	
,, ,, ,, 45th ,,	687 15 7	
		6,491 15 0
Crown Lands and reserves not exempted from the operation of ordinary licenses—		
*Hardwood and bark, timber of any kind	7,644 5 0	
		7,644 5 0
Seizures of timber—Proceeds of sale	528 1 10	
		528 1 10
Ringbarking inspection fees :—		
On pastoral leases	462 15 0	
,, pre-emptive leases	187 10 0	
		650 5 0
Total		17,565 5 8

* NOTE.—Licenses to quarry stone, &c., issued in addition to the above during the year, £685.

SCHEDULE C.

EXPENDITURE, 1884.

Particulars of service.	Amount.
	£ s. d.
Salaries	9,521 13 11
Travelling and contingent expenses	7,157 4 1
Wattle—Planting	254 4 0
Catalpa ,,	353 17 2
Cedar ,,	193 15 3
Total	£17,480 14 5

SCHEDULE D.

REVENUE from Exempted Reserves, year 1884.

County.	Reserve.	Quantity.	License Fee	Royalty.	Total.	Description of Timber.
		Royalty at per 100 superficial feet.				
		Super. ft.	£ s. d.	£ s. d.	£ s. d.	
Beresford	Murrumbucca	28,800	1 10 0	7 4 0	8 14 0	
Bland	Weddin	158,538	15 0 0	40 13 10	55 13 10	Pine and ironbark.
Bourke	Coolamon	979,171	43 10 0	244 17 7	288 7 7	Pine.
,,	Ganmain, No. 2		10 0 0		10 0 0	
,,	Matong	203,583	35 0 0	50 18 0	85 18 0	Pine.
,,	No. 2,652	1,275,843	46 10 0	318 19 7	365 9 7	,,
Cadell	Moama (3,254)	3,723,392	219 16 2	1,894 18 11	2,114 15 1	Red gum.
Camden	Cordeaux	290,787	54 5 6	72 13 9	126 19 3	Blackbutt, woollybutt, turpentine, and stringybark.
Clarence	Clarenza	169,091	28 15 0	42 11 5	71 6 5	Hardwood.
,,	Lawrence (242)	49,032	9 3 4	15 8 6	24 11 10	Spotted gum, ironbark, and woollybutt.
Cooper	Gogelderie	287,944	19 10 0	179 19 1	199 9 1	Red gum.
Fitzroy	Chambigne (259)		4 10 0		4 10 0	
,,	Cloud's Creek	642,233	192 0 0	320 3 6	512 3 6	Cedar.
,,	Dorrigo	115,575	33 10 0	57 15 9	91 5 9	,,
,,	Orara	235,425	79 0 0	117 14 6	196 14 6	,,
Macquarie	Cowarra (33)		0 10 0	1 5 0	1 15 0	Hardwood.
Mitchell and Urana	No. 3,053	45,000	4 10 0	11 5 0	15 15 0	Pine.
Northumberland	Olney	90,990	11 10 0	22 15 0	34 5 0	Grey gum, blackbutt, and turpentine.
,,	No. 129		34 16 6		34 16 6	
Pottinger	Denison	8,300	4 10 0	4 3 0	8 13 0	Pine.
Richmond	Tatham		22 10 0		22 10 0	
Rous	M'Pherson Range	59,500	4 10 0	29 15 0	34 5 0	Cedar.
,,	Terania Creek	230,819	212 6 2	57 14 6	270 0 8	Pine.
,,	Tweed River	52,353	3 0 0	27 8 6	30 8 6	Cedar.
Sturt	Wowong		13 0 0		13 0 0	

SCHEDULE D—*continued.*

County.	Reserve.	Quantity.	License Fee.	Royalty.	Total.	Description of Timber.
		Royalty at per 100 superficial feet.				
		Super. ft.	£ s. d.	£ s. d.	£ s. d.	
St. Vincent	Red-head	385,922	30 0 0	96 14 8	126 14 8	Blackbutt, ironbark, and spotted gum.
,,	Tomago	....	23 10 0	.....	23 10 0	
Townsend	Bullatella	.....	96 5 6	.....	96 5 6	
,,	Gulpa Island	299,306	150 10 8	175 5 0	325 15 8	Red gum.
,,	Moira	732,578	63 0 9	366 5 9	429 6 6	,,
,,	Morago	20,376	2 0 0	5 2 0	7 2 0	Pine.
,,	Tuppal	82,604	119 19 11	51 12 6	171 12 5	Red gum.
Wakool	Campbell's Island	821,316	69 0 0	410 13 0	479 13 0	,,
,,	Koondrook No. 1 (3,258).	3,407,207	194 4 4	1,723 11 11	1,917 16 3	,,
,,	Edward's River Extension.	.....	0 10 0	.....	0 10 0	
,,	Neimur	.....	6 0 0	.....	6 0 0	
Urana	Brookong	23,500	5 10 0	6 17 6	12 7 6	Pine.
,,	Osborne	116,300	15 0 0	29 1 6	44 1 6	,,
	Sundry Village Reserves.	34,350	1 10 0	9 1 9	10 11 9	Hardwood and ironbark.
	Total	14,569,035	1,880 3 10	6,392 10 0	8,272 13 10	
		Royalty at per tree.				
		No. of trees.				
Auckland	Brogo River (996)	6	1 0 0	0 15 0	1 15 0	River oak.
,,	Myrtle Creek	8	1 0 0	1 0 0	2 0 0	Ash, gum, and messmate.
Cadell	Moama (3,254)	24	3 0 0	12 0 0	15 0 0	Red gum.
Urana	Brookong	1	0 10 0	0 2 6	0 12 6	Pine.
Wakool	Koondrook No. 1 (3,258).	253	15 0 0	85 7 6	100 7 6	Red gum and pine.
	Total	293	20 10 0	99 5 0	119 15 0	
		Without Royalty.				
	Myall and Wallis Lakes and Forster	.....	350 5 0	.....	350 5 0	
	Totals—License fees			2,250 18 10		
	Royalty			6,491 15 0		
				£ 8,742 13 10		

SCHEDULE E.

STATEMENT of Revenue and Expenditure for each year from 1877.

Year.	Revenue.		Expenditure
	Forest Conservancy.	Forest Conservancy and Quarry Licenses.	
	£ s. d.	£ s. d.	£ s. d.
1877	.....	4,324 10 3	4,579 7 6
1878	.....	5,934 14 0	5,592 12 6
1879	7,309 18 2	7,945 18 2	5,920 2 11
1880	8,328 4 3	8,990 4 3	6,635 10 10
1881	10,155 13 8	10,812 13 8	7,093 4 11
1882	12,326 18 10	13,046 18 10	12,591 19 5
1883	16,060 19 7	16,685 19 7	15,398 15 11
1884	17,565 5 8	18,250 5 8	17,480 14 5

SCHEDULE F.

PROSECUTIONS undertaken by Forest Rangers.

Offence.	Number of Prosecutions.	Number of Convictions.	Amount of Penalty.
			£ s. d.
Illegally cutting and removing timber	156	98	86 16 11
Quarrying or removing other materials	18	17	14 15 0
Trespass on Crown Lands	24	19	56 0 4
	*198	134	157 12 3

* Exclusive of prosecutions by other Crown Lands Bailiffs

Number of cases in which timber or other material has been seized 105
Number of cases in which claims have been preferred to seized material 23
Number of cases in which such claims have been confirmed 6

SCHEDULE G.

SUMMARY of Timber Reserves.

	No. of Reserves.	Area in Acres.
Reserves from sale exempted from the operation of ordinary timber licenses by Special Proclamation—		
For timber supply	245	2,162,651½
For firewood	9	7,615
For protection of banks of rivers (includes 56 islands)	7	4,015
For shade, shelter, &c.	6	2,130½
	267	2,176,412
Reserves from sale, not exempted by Special Proclamation—		
For timber supply	506	3,057,269⅞
For firewood	24	156,832
	530	3,214,101⅞
Exempted reserves	267	2,176,412
Reserves not expemted	530	3,214,101⅞
	797	5,390,513⅞

SCHEDULE H.

SCHEDULE showing area and number of Reserves under supervision of the various Forest Rangers.

Locality.	Forest Ranger.	Number of Reserves.	Area in Acres.
Richmond and Tweed Rivers	H. S. Shadforth, Lismore	61	195,436
Upper Richmond	T. H. Green, Casino	18	261,923
Clarence	F. P. Huxham, Grafton; Assistant Ranger, F. M. C. Forster, Grafton.	30	172,806
Nambucca and Bellinger Rivers	W. Mecham, Boat Harbour; Assistant Ranger, W. M'Donald, Kempsey.	13	288,015
Northern New England and Gwydir	E. J. Deverell, Inverell; Assistant Ranger, W. Byron, Glen Innes.	46	254,047½
Gunnedah and Tamworth	G. W. West, Gunnedah	16	143,567
Armidale and Walcha	R. L. Siddins, Armidale	53	248,846
Port Macquarie	T. W. Wilson, Port Macquarie	12	79,391
Myall and Gloucester Rivers	P. Cullen, Booral*	3	25,154
Hunter River	E. Higgens, Muswellbrook	11	19,485¼
Mudgee and Cassilis	G. R. Brown, Mudgee	16	53,311
Dubbo	J. Martin, Dubbo	19	239,185
Condobolin	T. Kidston, Condobolin	19	118,728½
Upper Lachlan	R. Stevenson, Cowra; Assistant Rangers, R. Cork, Forbes, and J. G. Postlethwaite, Grenfell.	70	306,353¾
Penrith and Hartley	I. Noake, Penrith; J. Wilson (caretaker of three reserves)	8	40,499
Namoi	T. H. B. M'Gee, Narrabri; Assistant Ranger, G. King, Coonamble.	41	816,688
Brisbane Water and Wollombi	E. Cobcroft, Gosford; Assistant Ranger, F. E. Brunker, Cooranbong.	10	80,976
Mittagong and Camden	H. O. Rotton, Bowral	27	48,099⅞
South Coast and Manero	T. White, Candelo.	71	112,165½
Queanbeyan and Goulburn	T. M. Evans, Queanbeyan	15	71,265
North Wagga Wagga and Gundagai	W. Allen, Wagga Wagga	19	224,216
South Wagga Wagga, Albury, and Tumberumbah.	J. S. Taylor, Wagga Wagga; Assistant Ranger, J. Ward, Adelong.	40	379,324¾
Narrandera and Urana	J. G. Condell, Narrandera; Assistant Ranger, T. Musgrave, Urana.	70	228,598½
Murray, Edward, and Wakool Rivers	J. A. Manton, Moama; assisted by Rangers O. Wilshire, Denilquin; S. Payten, Tocumwall; J. Guilfoyle, Moama, and Assistant Ranger Cousins, Koondrook.	70	461,431½
Shoalhaven and South Coast	J. S. Allen, Ulladulla	30	506,195
Cumberland	J. M'Keown, Petersham, Cumberland Ranger	1	106
	Not under special supervision	8	14,700½
		797	5,390,518⅞

* Has also the supervision of the Myall and Wallis Lakes Forest, 217,600 acres.

SCHEDULE J.

NAME and Number and Area of Reserves, with particulars of the Timbers.

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timber.	Report and general remarks.
County.	Parish.				
Arrawatta	North Nullamanna and Wean.	958—Mount Gagan	3,600	Ironbark and pine	The good timber is very much scattered and mixed with scrub.
Do	Bonshaw	1,336	6,400	Ironbark (broad leaf), red gum, box, pine, and bloodwood.	Fairly timbered; medium quality.
Ashburnham	Bocabidgle	1,035	580	Pine and bull oak	Thickly timbered; principally immature timber.
Do	Gunningbland and Nellungalong.	1,147	3,500	Lachlan pine, forest oak	Thickly timbered.
Do	Gregra	1,373	320	Ironbark and Lachlan pine	Heavily timbered; good quality.
Do	Gregra and Brymedura	1,374	290	do do	do do
Do	Terrara, Coonambra, Bindogandri, and Bimbury.	1,403	12,760	Pine, ironbark, and stringybark	Fairly timbered; medium quality.
Do	Dulladerry, Terrara, and Bunbury.	1,730	6,500	Ironbark and Lachlan pine and stringybark.	Pine good; rest of timber fair quality.
Do	Dulladerry and Terrara	1,731	2,300	do do do	do do
Do	Wangan	2,030	190	Red gum and yellow box	The red gum is exceptionally good.
Do	Troubalgie, Dowling, & Wise	2,048—Yamma	16,320	Pine, bull oak, and box	
Argyle	Currowang	151—Lake George.	365	Gum, stringybark, and apple-tree	Reserved for firewood; timber evenly distributed.
Do & Murray	Merigan and Mulwaree	170—Wolowolar	3,200	Gum, stringybark, and mountain ash.	Well timbered; quality good.
Auckland	Cobra and Yuramine	337—Myrtle Creek	1,960	Mountain ash, messmate, blue gum, stringybark, cat-tail ash, and mountain gum.	Thickly timbered; medium quality.
Auckland and Wellesley.	Mila, Lawson, Gulgin, and Bondi.	385—Mila A	1,440	Peppermint, white gum, &c	Fairly timbered; inferior quality.
Do	Lawson and Bondi	385—Mila B	4,800	Messmate, ash, gum, and peppermint.	Densely timbered; good quality.
Auckland	Yowaka and Bimmil	774	2,375	Mountain ash, bloodwood, and blackbutt.	Timber inferior; much scorched by fire.
Do	Wyndham, Gnupa, and Cobra.	775	3,840	Stringybark, gum, and mountain ash.	Thickly timbered; good quality.
Do	Bournda	825	350	Bloodwood, blackbutt, stringybark, black ash.	do do
Do	Colombo	911	7,000	Messmate, cat-tail ash, silvertop gum, &c.	Well timbered; fair quality.
Do	Werriberri	991	1,000	Spotted gum, mountain ash, stringybark, and gums.	Densely timbered; good quality.
Do	Mumbulla, Bega, and Brogo.	996—Brogo River	350	Swamp oak and broadleaf wattle	This area is situated within the bed of the Brogo River.
Do	Mumbulla	1,003	3,000	Mountain ash, stringybark, box, peppermint, and wattle.	Densely timbered; poor quality.
Do	Bournda, Kameruka, and Wallagoot.	1,004	6,500	Mountain ash, stringybark, box, and woollybutt.	Densely timbered; inferior quality.
Do	Brogo	1,012	319	Red gum, apple, box, and stringybark.	Within the suburban boundaries of Brogo; well timbered; good quality.
Auckland and Wellesley.	Bredbendorra, Mogila, Cathcart, and Creewah	1,045—Reedy Creek	11,800	Ash, messmate, gum, silver wattle, and peppermint.	Densely timbered; good quality.
Baradine	Talluba, Minnon, Moglewit, Bullerawa, and Merimborough.	1,272	54,198	Pine, ironbark, box, belar, and oak	Thickly timbered; good quality.
Baradine and White.	Belmore, Coghill, Cook, Capp, Anson, Mollea, Nerable, Dampier, Crowie, Bohena, Quinn, Boral, and Merimborough.	1,273—Robertson A	151,400	Pine, ironbark, and box	Thickly covered with timber of good quality in all stages of growth.
Baradine and Leichhardt.		1,430—Ceelnoy	351,900	Ironbark, pine, box, belar, and oak	do do
Baradine	Rundle and Gora	1,657	17,920		
Do	Yarrigan	1,872	2,600	Pine and ironbark	Healthy growth of young timber; about two matured trees per acre.
Bathurst	Lucan and Wangoola	84	3,300	Stringybark and white box.	Thickly timbered with healthy young trees; no matured timber.
Do	Wangoola	87	985	do do	No matured stringybark; lightly timbered.
Do	Bracebridge	91	2,398	White box, appletree, mountain gum, and stringybark.	Timber of inferior quality; damaged by fire.
Do	Galbraith and Lowry	179	862	Stringybark	Thinly timbered.
Do	Tintern	184	2,923	Pine	
Benarba	Banarway	814—Keelo	2,500	Pine	Principally young timber.
Do	Caidmurra and Myall	1,207	700	Pine, bloodwood, gum, carbeen, and sandalwood.	No good matured timber; patches of young timber of prospective value.
Do	Boonery	1,381	1,400		
Do	Boonery	1,382	1,320		
Benarba and Stapleton.	Bundori, Newcastle, Kunopia, Tyrrell, Boronga, Paluanga, Bundora, &c.	1,331—Kunopia	2,240	Pine and carbeen	Thickly timbered; good quality.

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timber.	Report and general remarks.
County.	Parish.				
Beresford	Cooma & The Brothers.	157	1,929	White gum and pine	Fairly timbered; in parts scrubby and inferior; reserved for water supply and firewood.
Do	Murrumbucka	266—Murrumbucka.	960	Pine, white gum, and apple-tree	Well timbered; inferior quality.
Do	Bulgundramine	287—Bulgundramine.	2,500	Peppermint, cabbage, and white gum.	Only suitable for fencing-stuff and fuel.
Do	Callaghan	397	240	White gum and apple-tree	Reserved for fuel.
Do	Gladstone	438A—The Peak	20½	Cabbage gum	A lightly wooded knoll; also reserved for trigonometrical purposes.
Do	Dangelong	460—Dangelong	195	Cabbage gum	Inferior quality; reserved for fuel.
Do	Woolumla	498	280	Cabbage and white gum	Sparsely wooded; reserved from sale for firewood.
Do	Coolringdon	622	1,066	White gum, box, and peppermint.	
Do	Umaralla	653	1,200	White gum, pine, and peppermint	Only suitable for fuel.
Do	Dandelong	716	1,019	Cabbage and white gum	Inferior quality; suitable for fuel and fencing stuff.
Do	Montagu	717	534	White gum and peppermint	Lightly timbered; inferior.
Do	Big Badja	877	2,200	Cat-tail ash, mountain ash, and white gum.	Fairly timbered.
Beresford and Wallace	Jillamatong & Bradley.	1,016—Jillamatong.	2,350	Peppermint and white gum	Fairly timbered; medium quality.
Bland	Jingerangle	1,357	1,464	Pine, bull oak, belar, and white box.	Densely timbered; fair quality.
Do	Warralonga	1,413	1,294½	Pine, white box	Fairly timbered.
Do	Caragabal	1,460	570	Pine, white box, and yellow box.	Timber generally of good quality.
Do	Boonabah	1,574	512	Pine, white box, and bull oak	Pine of good quality; box inferior.
Do	Bimbella and Wyrra	1,825	11,520	Pine, ironbark, and box	Pine of good quality; box inferior.
Do	Eurabba and Euroka	1,830A	3,260	Pine, red gum, forest oak, and white box.	Pine and gum good; rest of timber faulty.
Do	Weedallion	1,831	3,600	Pine, forest oak, and white and yellow box.	Timber of fair quality; pine requires thinning.
Do	Bribaree	1,832	360	Pine, forest oak, and white box	Pine and forest oak require thinning.
Do	Curraburrama	2,068	837	Pine, bull oak, white box and yellow box.	Little good matured timber.
Do	Mininjary, Caragabal, and Jingerangle	2,185	1,400	Pine, bull oak, belar, and white box	Pine fairly distributed and good quality.
Do	Stockinbingal and Dinga Dingi.	2,190	1,240	Pine and white box	Timber of fair quality.
Do	Caragabal and Berendebba.	2,330	1,160	Pine, white and yellow box, and bull oak.	Timber of poor quality.
Do	Mandamah	2,538	7,520	do do	
Do	Yerai	2,745	3,080	Pine, white and yellow box	Timbered principally with immatured pine.
Do	Wargin	2,864	724	Pine, forest oak, and box	Pine and box timber of fair quality.
Do	Narraburra, Boginderra, and Thurungly	2,873	10,880	Pine	
Do	Combaning and Trigalong.	3,056	4,250	do	A large growth of prospective value, besides box and yellow jacket.
Do	Trigalong	3,079	154	do	
Bland and Harden	Congou and Jindalee	1,274—Burthong	3,260	Ironbark and stringybark	Lightly timbered.
Bland and Monteagle.	Euroka, Marowie, Bimbi, and Weddin	1,855—Weddin	34,560	Pine, white and yellow box, and ironbark.	Thickly wooded; pine requires thinning.
Bland and Forbes	Wheogo, Maudry, and Yuline.	2,896	8,800	Ironbark, box, pine, and stringybark.	Fairly timbered; good quality.
Bland and Clarendon.	Sebastopol & Trigalong	3,082	333	Pine	
Bligh	Bobadeen	62	882	Ironbark, stringybark, pine, box, and apple.	Fairly timbered; medium quality.
Do	Doulagunmala	109	125	Apple-tree and white box	Timber of inferior quality.
Do	Collaroy	110	400	Ironbark, box, and pine	Fair quality; pine requires thinning
Do	do	111	700	do do	do do
Bligh	Turill	124	2,248	Ironbark, apple, pine, box and stringybark.	Timber inferior quality; the best matured has been removed.
Do	Bellaleppa	130	368⅝	Red gum, stringybark, and box	Thinly timbered; poor quality
Do	Warung and Gunna	142	1,970	Stringybark and red gum	Thickly timbered; quality very good.
Do	Warung	143	2,150	do do	Thickly timbered; fair quality
Do	Munmurra	158	12,646	Ironbark, pine, and red and slaty gum.	Thickly covered with timber in all stages of growth.
Do. Pottinger and Napier.	Brennan, &c.	646—Brennan's Gap	6,720	Blue gum and stringybark	Well timbered; condition good
Bligh & Lincoln		1,598	360	Box and Ironbark	Fairly timbered; medium quality.
Bourke	Berrembed	281	1,760	White and yellow box and red gum.	The best matured timber has been removed.
Do	Ganmain	303A—Ganmain	1,920	do do	do do

SCHEDULE J—*continued.*

Locality. County.	Locality. Parish.	Number and name of reserve.	Area in acres.	Description of principal kinds of timber.	Report and general remarks.
Bourke	Kindra and Coolamon	892—Coolamon A.	34,675	Pine, white and yellow box, and bull oak.	The pine is of value for saw-mill purposes; other timbers only valuable for shade and fencing material.
Do	Coolamon, Kindra, and Berry Jerry.	892—Coolamon B.	1,280	do do	do do
Do	Hooke, Ganmain, and Kockibitoo.	1,251—Ganmain No. 2A.	9,246	do do	The best matured pine has been removed; thick growth of young pine of prospective value.
Do	Ganmain	1,251—Ganmain No. 2B.	3,540	do do	Best matured pine has been cut; a thick growth of young pine.
Do	Elliott, Kockibertoo, and Matong.	1,421—Matong	13,280	Pine	Good growth of young pine.
Do	Robertson	1,439—Currajong	25,555	Pine, white and yellow box, and bull oak.	Most of the matured timber has been cut; young pine requires thinning.
Do & Cooper	Jillett and Willandra	1,654—Willandra	11,520	Murray pine and box	Fairly timbered; young pine requires thinning.
Bourke	Ardlethan, Ariah, and Davidson.	2,548—Clear Paddock.	10,240	Pine	Timber in all stages of growth; requires thinning.
Do	Ashbridge, Dulah, and Devlin.	2,652	62,000	Pine	A healthy growth of young and matured pine. The box timber and some pine under 7 inches in diameter ringbarked before the reserve was proclaimed.
Do	Davidson, Kildary, and Langikalkal.	2,761	7,400	Pine	The area embraces fine belts of pine, with young timber growing in intervening spaces
Do	Beaconsfield & Trickett	2,784	8,440	Ironbark, box, and pine	Fairly timbered.
Do	Ingalba & Northcote	2,785	16,000	do do	do.
Do	Mandamah	2,786	4,550	do do	
Do	Ramsay and Yithan	3,041	6,600	Pine, ironbark, and box	Well timbered with pine, &c., in all stages of growth; useless timber ringbarked before the land was reserved.
Do	Yarranjerry	3,043	3,970		
Brisbane	Wentworth	96	1,360	Box, red gum, and stringybark	Box timber of inferior quality; red gum and stringybark fair.
Do	Watt and Campbell	95A	3,602¾	Ironbark, red gum, and pine	Fairly timbered; good quality.
Do	Myrabluan	154	135	Ironbark and box	Timber of medium quality fairly distributed over the whole area.
Do	Wingen	179	760		
Do	Brawboy and Manbus	183	400	Ironbark	The whole area embraces timber of present and prospective value.
Do	Park	221	1,800	do	Fairly timbered.
Do	Cherson	229	251½		
Do Buckland, and Parry.	Parnell, Loder, Crawney, Temit, and Lincoln.	1,266—Crawney	10,780	Stringybark and gum	Also reserved for camping.
Boyd	Uri	180	1,400	Red gum and box	Well timbered.
Do	Carrabury	182	1,280	do	do
Do	Coleambally	1,731—Coleambally	1,566	Pine and box	Pine healthy; box of poor quality; the surrounding district is thinly timbered.
Do	Argoon	1,754—Argoon No. 1	1,692½	do do	do do
Do	Mygotha	1,755— do No. 2	640	do do	do do
Do	do	1,756— do No. 3	1,052½	do do	do do
Do	do	1,757— do No. 4	538	do do	do do
Do	do	1,780	2,745	do do	do do
Do	do	1,781	640	do do	do do
Do	Argoon	1,782	412½	do do	do do
Do	do	1,783	640	do do	Pine, healthy and sound; box, of little value; surrounding districts thinly timbered.
Do	do	1,785	693	do do	do do
Do	Eunanbrennan	1,884	937	do do	do do
Do	Cararbury	1,905—Cararbury	2,240	Red gum and box	The gum is of good quality; box inferior.
Do	Waddi	1,997—Waddi	1,207½	do do	Thickly covered with timber in all stages of growth.
Do	Waddi	1,998	1,162½	Pine and box	Well timbered with young pine; few matured trees
Do	Boona	2,238	2,163¾	do	do do
Do	Waddi	2,258	1,200	Red gum	Fairly timbered.
Do	Ourendumbu	2,526	560	Murray pine and box	Well timbered; matured pine of good quality; timber scarce in surrounding district.
Do	do	2,527	640	do	do do
Buccleuch	Weejasper	2,341—Weejasper	23,040	Mountain ash, stringybark, ribbon and white gum, blackbutt, yellow box, and apple-tree	Timber of fair quality in all stages of growth.
Do	Cooleman	2,926	5,500	Messmate, stringybark, and ribbon gum	Fair quality; evenly distributed.
Do	Brungle & Killimicat	3,126—Pine Mountain	1,721	Pine	Pine timber scarce in surrounding neighbourhood.

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timber.	Report and general remarks.
County.	Parish.				
Buccleuch	Bramina	3,150	7,680	Stringybark	
Do	Adjunbilly & Wyangle	3,177—Red Hill	14,000	Stringybark, red gum, white box, and apple.	Fairly timbered.
Do	Talbingo and Journima	3,234	8,000	Messmate, stringybark, red gum, and euraba.	Timber of superior quality.
Buckland	Werrie	2,003	707		
Buller	Acacia	590—Acacia Creek	700	Pine and hardwood	Well timbered; quality good.
Do	Acacia	1,439a	3,800	Stringybark, messmate, blue gum, silky oak, white pine, red gum, peppermint.	This reserve embraces good timber in all stages of growth.
Buller, Drake, and Rous	Mummulgun, Dyraaba, Babyl, Toonumbar, and Sherwood.	1,120	83,200	Pine, cedar, and hardwood	Well timbered; good quality.
Buller and Clive	Barney Downs and Boonoo Boonoo.	1,624	3,200	Stringybark, messmate, blue gum, woollybutt, red gum, white box.	Timber of fair quality in all stages of growth.
Burnett & Murchison.	Adams, Dumboy, Delingera, & Wyndham.	1,373	30,000	Pine and hardwood	Well timbered; good quality.
Cadell	Toorangabby and Perricoota.	2,420	1,450	Flooded red gum and box	
Do	Moama and Bama	3,252—Backwater Creek.	6,500	Flooded red gum	Thickly timbered; in all stages of growth.
Do	Bama, Gulpa, & Moira	3,253—Moira	37,000	Flooded red gum and pine	Well timbered; quality generally good.
Do	Toorangabby, Tomara, Burrumburry, Tantonan, and Thule.	3,254—Moama	51,000	Red gum and pine	Most of the available matured timber removed; good growth of young trees.
Do	Perricoota	3,255	810	Flooded red gum and box	
Camden	Wollongong	38a—Illawarra	580	Woollybutt, mountain ash, swamp mahogany, and beech.	On sea coast; timber of inferior quality but useful as a breakwind.
Do	Burrawang	43a	59	Blackbutt, turpentine, woollybutt, and white box.	Fairly timbered; good quality.
Do	Wonona, Dendrobium, and Cordeaux.	57—Cordeaux	24,500	Blackbutt, turpentine, blue gum, stringybark, messmate, beech, sassafras, and yellow jacket.	Timber of fair quality.
Do	Jamberoo and Kiama	78	202	White box, messmate, peppermint, and bloodwood.	Timber fairly distributed; medium quality. Also reserved for public recreation.
Do	Burrawang & Yarrunga	80—Fitzroy Falls	1,875	Mountain ash, stringybark, and peppermint.	Timber inferior. Also reserved for public recreation.
Do	Jamberoo	112	200	White box, messmate, bloodwood, and peppermint.	Thickly timbered. Also reserved for public recreation.
Do	Wallaya	119—The Cliffs	4,840	White box, woollybutt, messmate, mountain ash, and leather-jacket.	Thickly timbered; fair quality; a small quantity of cedar.
Do	Bunberra	120a—Broughton Creek.	150	Leather-jacket, ash, beech, sassafras, and box.	Fairly timbered; medium quality.
Do	do	121a	110	do do	do do
Do	Wallaya & Broughton	122—Brogers Creek	440	White gum, messmate, mountain ash, and stringybark.	The timber on the reserve is difficult of access.
Do	Yarrawa & Burrawang	154—Belmore Falls	1,700	Cedar, turpentine, white box, woolybutt, blackbutt, stringybark, and brush timbers.	This reserve embraces some very valuable cedar and other timbers.
Do	Broughton	155	15	Leather-jacket, box, and scrub timbers.	Fairly timbered; medium quality.
Do	do	156	52	Leather-jacket, box, scrub timber, and a few young cedars.	do do
Do	do	157	60	Leather-jacket, white box, and scrub timber.	Fairly timbered; good quality.
Do	Yarrawa	167	100	Box	Thickly covered with common brush and a few box trees. Also reserved for access to water.
Do	Broughton & Wallaya	168	2,968	Leather-jacket, white box, messmate, mountain ash, and scrub timber.	Timber of good quality; a few young cedar trees.
Do	Cambewarra	172	170	Hardwood	
Do	do	173	100	Leather-jacket, messmate, box, turpentine, and a few cedars.	Well timbered; good quality.
Do	Cambewarra & Bunberra	174	350	Leather-jacket, coachwood, sassafras, and messmate.	Fairly timbered; medium quality.
Do	Jamberoo & Kangaloon	175	1,600	Blackbutt and messmate	Timber of fair quality. Reserved principally for public recreation.
Do	Burrowang	177	105	Blackbutt, messmate, and a few young cedars.	Fairly timbered.
Do	Kembla & Calderwood	179	100	Messmate and mountain ash	Timber inferior. Reserved principally to protect foliage on Coast Range and for public recreation.
Do	Calderwood	180	120	White box, messmate, and brush timbers.	Timber fair quality, but difficult of access. Reserved principally for recreation.
Do	do	181	320	White box, messmate, and brush timbers.	Timber of little commercial value. Reserved principally for public recreation and to protect foliage on the Coast Range.

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timber	Report and general remarks.
County.	Parish.				
Camden	Yarrawa	184	7½	Yellow-jacket and sassafras	Reserved principally for public recreation.
Do	Cambewarra	197	30	Brush timbers	Includes face of very high precipice; timber very ornamental.
Do	Wallaya	199	50	Cedar and hardwood	
Do	do	200	60	do	
Do	Kiama	201	100		
Do	Kangaloon	202	150	Blackbutt, messmate, and brush timbers.	Also reserved for public recreation.
Do	Bugong	203	250	Messmate, turpentine, woollybutt, cedar, and brush timbers.	Fairly timbered; medium quality.
Do	Burrawang	204	250	Cedar and hardwood	Also reserved for public recreation.
Do	do	205	300	Mountain ash, peppermint, white box, and messmate.	Timber of little value. Also reserved for public recreation.
Do	Yarrawa	206	325	White box, messmate, mountain ash, and peppermint.	Timber of little value. Reserved principally for public recreation.
Do	Bugong & Cambewarra	207	650	Turpentine, box, woollybutt, messmate, stringybark, ironbark, and brush timbers.	Fairly timbered; quality good.
Do	Cambewarra	209	1,000	Turpentine, messmate, woollybutt, box, cedar, and brush timbers.	About one-third of the area embraces timber of commercial value. The land is also reserved for public recreation
Do	Illaroo	211	107	Cedar, box, and turpentine	
Do	Yarrawa	212	4,000	Cedar, box, and turpentine	
Do	Yarraba	216	4a. 37p.	Brush	Within Robertson Village Reserve.
Do	Bugong	218	45	Brush timber	Reserved principally for ornamental purposes.
Do	Cambewarra	219	50	Box, messmate, and brush timbers.	do do
Do	Wallaya	220	375	Brush timbers	Reserved for recreation and ornament.
Do	Burrawang	231	370		
Cook	Irvine	33—Mount Wilson No. 3.	160	Mountain ash, stringybark, red and white gum.	Thick growth of fair timber.
Do	Linden, Kedumba, and Cooba.	157	4,800	Mountain ash and gum	Timber generally of poor quality.
Do	Irvine	201—Mount Wilson No. 1.	61	Mountain ash, stringybark, peppermint, grey gum, and sassafras.	Well timbered, good quality.
Do	do	202—Mount Wilson No. 2.	28	Mountain ash, stringybark, peppermint, and sassafras.	do do
Clarke	Rampsbeck, Allingham, Aberfoyle, and Kangaroo.	886	1,280	Stringybark, red gum, and peppermint.	Stringybark fair; other timber inferior.
Do	Nowland and Warner	967—Mt. Hourigan	2,320	do do	do do
Do	Avondale	1,051	1,720	do do	do do
Do	Big Hill, George, Clarke, Jeogla, Styx, Serpentine, and Cunnawarra	1,662	45,000	Cedar, hardwood, and brush timbers	Well timbered.
Do	Snowy and Serpentine.	1,663	17,000	Stringybark, blackbutt, and blue gum.	do
Clarence		38—24 islands in the Clarence River	1,184	Oak, gum, and ornamental scrubs.	Timber on these islands reserved principally to protect the land from being washed away.
Do	Banyabba, Richmond, and Lawrence.	242—Lawrence	16,000	Ironbark, stringybark, beech, blackbutt, grey gum, and blood-wood	Timber evenly distributed; good quality
Do	Tyndale, Cunoulum, and Coldstream.	243—Coldstream A	16,000	Spotted gum, blackbutt, ironbark, mahogany, and tallow-wood.	do do
Do	Coldstream	243—Coldstream B	1,200	do do	do do
Do	Glen Ugie	244A—Glen Ugie	8,320	Spotted gum, ironbark, blackbutt, white box, and grey gum	do do
Do	Chapman	245A—Coalbrook	12,800	Ironbark, red gum, blackbutt, bloodwood, stringybark, flooded and spotted gum	do do
Do	Great Marlow	260—Alumy Creek	71	Ironbark, beech, grey gum, and mahogany	do do
Do	Southgate	353—Southgate	4,480	Ironbark, spotted and grey gum, bloodwood, tallow-wood, blackbutt	Thickly covered with good timber in all stages of growth; ironbark and spotted gum the most numerous.
Do	Woodford	394—Woodford	20	Box, bloodwood, mahogany, tallow-wood, spotted gum, and grey pine	No timber of commercial value; reserved for botanical purposes.
Do	Elland and Lanitza	406A—Clarenza	3,921	Spotted gum, box, ironbark, red and grey gum	Thickly timbered; young timber of very good quality.
Do	Woodford	979—Woodford Island	740	Blackbutt, stringybark	Thickly timbered. Also reserved for other public purposes.
Do	Ashby	1,038	670		
Do	Richmond	1,039	720	Ironbark	Timber of fair quality on north-east portion of reserve.
Do	Taloumbi & Gulmarrad	1,041A	2,576		Lightly timbered; inferior quality.
Do	Lawrence	1,124	2,860		do do
Do	Southgate	1,204	60		do do

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timber.	Report and general remarks
County.	Parish.				
Clarence and Richmond	Banzabba, Myall, Richmond, Woombah, and Gibberagee.	1,101—Richmond Range	12,800	Hardwood	Well timbered; good quality.
Cowley	Congwarra	426—Congwarra	3,200	Ribbon gum, brittle gum, stringybark, box, apple-tree, river oak	Thickly timbered; quality good
Do	Naas	667—Naas Valley	640	Ribbon, white, and brittle gum, peppermint, apple-tree, & stringybark	do do
Do	Yarrara	668—Tarara	640	Stringybark, brittle gum, apple-tree, and box	do do
Do	Uriarra	725—Uriarra	6,500	Stringybark, apple-tree, peppermint, and mountain ash	Timber of fair quality.
Do	Gurrangora	871	960	Grey gum and mountain ash	Timber of fair quality.
Do	Orroral	888	640	Ribbon and brittle gum	Timber of superior quality.
Do	Booroomba	889	900	Ribbon and white gum, sallow, messmate, peppermint, and hickory	Fairly timbered; medium quality.
Do	Mullion	3,005	3,180	Ribbon gum, swamp gum, ash, stringybark, and yellow box	Thickly timbered; superior quality.
Cumberland	Gordon	97—Middle Harbour	106	Gum, stringybark, and scrub	Timber of value only for fuel.
Do	Bulgo and Heathcote	110—Bottle Forest	5,742	Blackbutt, bloodwood, spotted gum, and mountain ash	Blackbutt of superior quality; other timber generally inferior.
Courallie	Weebullabulla, Menandool, and Bundoowithidie	948—Mungie Bungie	800	Pine	No matured timber; healthy growth of young.
Do	Weebullabulla	949—Weebullabulla	1,816	Pine, box, rosewood, and ironbark	The young pine is the only timber of prospective value; best matured pine cut.
Do	Carore	1,059	2,700	Pine, box	No matured pine; box only suitable for splitting; healthy growth of young pine.
Do	Weah Wah	1,300	2,200	Pine, brigalow, and box	Fairly timbered; prospective value.
Do	Fletcher	1,380	5,800		
Cowper	Bomlega	1,202	2,260	White pine, box, and coolebar	Thinly timbered; the white pine is the only timber of commercial value.
Cooper	Grong Grong	310—Bundidgerie	2,240	Red gum and box	No matured timber of commercial value; healthy growth of young.
Do	Bolaro	1,881	3,240	Pine, box	Pine good, box inferior; healthy growth of young pine.
Do	Sandy Creek, Dowling, and Yareolgan.	2,211	15,360	Pine and box	Pine good, box inferior; healthy growth of young pine.
Do.	Bingar, Binyar and Stanbridge.	2,740A	30,000	Pine	Thickly timbered with good pine in all stages of growth.
Do	Bingar	2,740B	40	do	do do
Do	Coolaragang and Cuba	2,984—Darlington	1,020	Red gum and box	Red gum of good quality; box inferior.
Do	Cuba and Hulong	2,985—Hulong	5,098	do	do do
Do	Dallas	2,986—Dairy Point east	300	do	do do
Do	Dallas, Gogeldrie, and Yarrangery.	2,987—Gogeldrie	6,560	do	do do
Do	Yarrangery	2,988—Yarrengery	3,820	do	do do
Do	Coolaragang	2,992—Cuba	880	do	do do
Do	Dallas	2,993—Dairy Point	2,200	do	do do
Do	Yalgogoring	3,032	3,200	Black and white pine	Fairly timbered with good pine in all stages of growth.
Do	do	3,033	1,300	do	Thickly timbered with superior pine in all stages of growth
Do	Bolaro	3,035	1,350	Pine	Well timbered with valuable matured and young pine; the box ringbarked and scrub pine destroyed before reserve was made.
Do	do	3,036	4,200	Pine	Thickly timbered with good pine in all stages of growth.
Do	Barralong	3,037	3,200	Pine	Well timbered; very good quality.
Clarendon	Sebastopol	3,081	40		
Clarendon and Harden	Burra, Muttama, Mitta Mitta, and Ulandra.	2,284—Mitta Mitta	1,920	Stringybark, white box, and wattle	Matured timber inferior; healthy growth of young timber.
Do		2,693	320		
Cunningham	Murda and Condoublin	1,269—Condoblin	3,300	Pine, box, yarren, and wilga	Pine of good quality in all stages of growth; other timbers inferior.
Do	Gunning	1,538	4,400	Lachlan pine	
Do	Linda and Tollingo	1,871	3,200	Pine, box, yarren, and budda	Fairly timbered.
Do	Yaratta, Mowalba	1,984	3,700	Pine and box	Fairly timbered.
Do	Mount Nobby & Taratta	1,985	3,450	do	Thickly timbered; pine good; box hollow and crooked.
Clive and Gough	Angopera and Parkes	1,337	14,000	Stringybark, woollybutt, red gum, messmate.	Fairly timbered.
Do.	Parkes, Scott, and Eastern Water	1,448	14,200	Stringybark, messmate, woollybutt, blue and grey gum, sassafras, and honeysuckle.	

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timber.	Report and general remarks.
County.	Parish.				
Clive	Dickson & Forest Land	1,378A	13,600	Tallow-wood, stringybark, messmate, woollybutt, red gum, and sassafras.	Fairly timbered; country very rough.
Dampier	Bodalla	249—Tuross	380	Spotted gum, ironbark, mahogany, blackbutt, and box.	Thickly timbered; good quality
Do	Bermaguee and Cadjancarry.	305—Bermaguee	2,700	Ironbark, stringybark, blackbutt, gum (spotted and white), &c.	do do
Do	Wagonga	307 - Wagonga	8,040	Ironbark, &c.	do do
Do	Bergalia	483—Bumbo	3,800	Stringybark, spotted gum, ironbark, peppermint, redwood, mountain ash, &c.	do do
Do	Tanja	1,002	2,500	Mountain ash, stringybark, gum	Thickly timbered; fair quality
Drake	Fairfield and Timbarra	248—Timbarra	31,360	Stringybark, ironbark, red gum, messmate, bloodwood, box, and mountain ash.	Thickly timbered; good quality
Do	Mookimir and Rodham	537—Mt. Neville	38,400	Red gum, bastard, box, spotted gum, ironbark, blackbutt, mahogany, cedar, and brush timbers.	Thickly covered with timber of good quality, in all stages of growth.
Do	Alice	913	500		
Do	Picarbin	929	80		
Drake and Richmond.	Pickapene, Alice, Coongbar, Wyon, and Busby.	379—Pickapene	10,365	Mountain pine, red and white gum, ironbark, peppermint, spotted gum, stringybark, beech, messmate, and silky oak.	A plentiful supply of good timber.
Drake, Richmond, and Rous	Shannon, Mummulgum and Sandilands.	995	19,200		
Dension	Cottaddida	107	270	Red gum and pine	
Do	Wahgunyah	1,591—Wahgunyah	4,120	Pine, oak, blue gum, and grey box	Fairly timbered; young pine requires thinning.
Do	Warmatta	1,592—Savernake	640	Pine, bull oak, blue gum, and grey box.	Pine fair; other timbers inferior
Do	Boomanoomana	1,639	400	Red gum	Thickly covered with good timber, in all stages of growth
Do	Dry Forest	1,656A	560	Pine	Thickly timbered; few matured trees.
Do	do	1,656B	648	do	do do
Do	Turramia	2,386	420	do	Thickly covered with timber in all stages of growth.
Do	Wahgunyah	2,868	400	Pine, blue gum, and grey box	Timber fairly distributed; no mature pine.
Do	Gereldery	3,119	375	Pine, black wattle	Thickly timbered with young pine and black wattle.
Do	Warmatta	3,144	740	Pine and oak	
Do	Mulwala and Turramia	3,208—Mulwala West	1,340	Red gum	Thickly covered with young timber; fair number matured.
Do	Boomanoomana	3,209 — Boomanomana, No. 1.	960	do	do do
Do	do	3,210—do No. 2	2,100	do	do do
Do	do	3,211—do No. 3	108	do	do do
Do	Cottadidda	3,212—Cottadidda, No. 1.	300	do	Thickly timbered; principally young.
Do	do	3,213—do No. 2	280	Red gum and pine	Pine on about 4 acres; remainder thickly timbered with gum.
Do	do	3,214—do No. 3	150	Red gum	Thickly covered with young timber; about three matured trees per acre.
Do	Barooga	3,215—Burroogo	2,500	do	Thickly covered with timber in all stages of growth.
Do	Mulwala and Turramia	3,216—Mulwala	4,396¾	do	do do
Do	Cottadidda	3,240	105	do	
Do	Tocumwal	3,241	400	do	
Do	Woperana	3,242	360	do	
Darling	Hobden	1,270—Darling	12,800	Stringybark, grey gum	
Do	Nangarah	1,457—Bundarra	5,120	Red gum, ironbark, stringybark	
Do	North Barraba and Tiabundie	1,585	3,840	Ironbark	
Do	Halloran	1,737	3,900		
Durham	Goorangoola	79—Ravensworth	1,184	Ironbark, red and spotted gum, and box.	Good growth of young timber; all the best matured trees cut.
Do	Hinton	158	400	Ironbark, spotted gum, grey gum, stringybark, box, and forest oak.	Fairly timbered; reserved for fuel.
Do	Savoy	174—Grass Tree	472	Ironbark and spotted gum	Thinly timbered; inferior quality.
Do	Dyrring and Broughton	195	1,250	Spotted gum, red gum, blackbutt, and blue gum.	Fairly timbered; good quality.
Do	Mount Royal and Leibeg	196	10,000	Blue and grey gum, box, stringybark, blackbutt, and turpentine.	The area also contains some young cedar.
Dudley	Kalateenee	112—Maria River	2,453	Tallowwood, blackbutt, flooded blue and grey gum, forest mahogany, bloodwood, turpentine, ironbark, stringybark, brush box	A fair supply of good matured timber, besides a large quantity of prospective value.
Do	Cunnawarra, Comara, Lignum & Nulla Nulla	158—Styx River	80,000	Blackbutt, tallow-wood, gums, oak, box, bloodwood, mahogany, cedar, and brush timbers.	Thickly covered with timber of excellent quality in all stages of growth.
Dudley & Raleigh	Tanban, Barranyatti, Unkya, Allgomera, & Collombatti	110—Allgomera	54,150		

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timber.	Report and general remarks.
County.	Parish.				
Denham	Murkadool	1,818—Pockataroo.	640	Pine	Some good matured trees; healthy growth of young pine.
Ewenmar	Tacklebang	1,073	760	Pine, myall, and belar	Timbered principally with pine of fair quality.
Do	Gewah	1,075	2,710	Pine, belar, and box	
Do	Bungey	1,076	3,500	Pine, box, belar, and ironbark	Fairly timbered; medium quality.
Do	do	1,077	3,000	Box, pine, and belar	do do
Do	Galargambone	1,555	500	Pine	Fairly timbered.
Do	Warrie	1,556	1,480	do	do
Ewenmar and Gregory.	Galargambone & Tailby	1,138A	1,040	do	Fairly timbered; in all stages of growth.
Do	Tailby	1,138B	2,560	do	do
Flindus	Babinda and Gumbine	2,086	6,600	do	Thickly timbered; good quality.
Finch	Baloon	525	2,560		
Do	Moori	526	2,160		
Do	Dalbandri	744	2,380	Pine	This area embraces a fine forest of pine in all stages of growth.
Do	Deripas	745	1,920	do	do do
Do	Yarraman	746	3,360	do	do do
Do	Langloh and Birben	838	2,560	do	Timber of inferior quality; timber of any kind scarce in the surrounding district.
Do	Dunumbral	892	624¾	Pine, belar, box, &c.	Few matured trees of value; good growth of young timber.
Do	Dunumbral and Somerville.	893	4,776	do do	do do
Do	Dunumbral	894	947½	do do	do do
Franklin	Wirringa	2,695	225		Timber scarce in the surrounding district.
Do	Goolagunni, Terry, Kongong, & Gonowlia.	2,711	7,160	Pine	Timber of superior quality.
Fitzroy	Moonee and Coff	136—Moonee	15,360		
Do	Ermington	259—Chambigne Creek, No. 1.	3,200	Pine, spotted and red gum, ironbark, stringybark, and forest oak.	Timber fairly distributed; superior quality.
Do	Moonpar, Cope, Wirriri, Jardine, and Herborn.	354—Cloud's Creek	48,000	Cedar, red gum, box, ironbark, stringybark, forest oak, pine, bloodwood, blackbutt, tallow-wood, beach, rosewood, and mountain ash.	Thickly covered with superior timber in all stages of growth.
Do	Tyringham and Dorrigo	355—Glen Fernie Creek.	5,760	Cedar, pine, tallow-wood, stringybark, forest oak, red gum, rosewood, tulipwood, and beech.	do do
Do	Bellinger, Coff, Macleay, and Moonee.	642—Orara	16,000	Cedar, flooded gum, turpentine, blackbutt, tallow-wood, ironbark, red mahogany, blue gum, rosewood, sassafras, coachwood, brush cherry, and beech.	Thickly covered with splendid timber in all stages of growth; most of the matured cedar removed.
Do	Chambigne	665—Chambigne Creek, No. 2.	8,640	Ironbark, spotted gum, red gum, box, stringy-bark, forest oak, and pine.	Thickly timbered; fair quality.
Do	Woogoolga	1,043	960		
Do	Bagawa, Orara, and Moonee.	1,044A	8,760		
Do	Woogoolga	1,045	1,440	Ironbark, grey gum, mahogany, forest oak, and brush.	Well timbered; good quality.
Do	Corindi	1,046	384		
Do	Woogoolga	1,047	3,600		
Do	Woogoolga, Waihou, and Corindi.	1,146	4,400	Hardwood	Fairly timbered; medium quality.
Fitzroy & Raleigh	North Bellinger, Fitzroy, Bonville, and Wonga Wonga.	121—Bellinger	33,820	Blackbutt, tallowwood, ironbark, turpentine, flooded gum, and beech.	Fairly timbered; best of the matured timber cut.
Do	Allan Water, Vautin, Allan, Raleigh, Leigh, and Bostobrick.	377—Dorrigo	52,480	Cedar, pine, rosewood, beech, mountain ash, tulipwood, beantree, plum, sassafras, and grey gum.	Densely covered with fine healthy timber in all stages of growth; one of the most valuable cedar reserves.
Fitzroy	Corindi	1,205	960		
Do	Woogoolga	1,254	1,280		
Forbes	Morongla	1,143—Cowra	5,440	Lachlan pine, white and yellow box.	Thickly covered with young timber.
Do	Mulyandry and Erasa	1,306A	3,705	do do	Thickly timbered.
Do	Mulyandry and Bandon	1,350A	2,720	do do	do
Do	Jemalong	1,724—Jemalong	610	Lachlan pine, red gum, and white box.	
Do	Broula	2,880	724	Lachlan pine	Few matured trees; good growth of young pines.
Do	Ooma, Birangan, and Warraderry.	3,013	5,820	Pine, ironbark, and box	
Do	Birangan and Bogalong	3,115	2,980	Pine and box	
Forbes & Gipps	Carawandool	1,361	12,160	Lachlan pine, myall, yarren, boree, and forest oak.	Well timbered.
Forbes & Monteagle.	Eualdrie and Weddin	2,895	5,500	Ironbark, pine, stringybark, and box.	
Gloucester	Bergan and Talawahl	46—Forster A	21,490½	Blue and grey gum, brush box, turpentine, ironbark, stringybark, forest mahogany, and bloodwood.	Very heavily timbered; quality good, in all stages of growth.
Do	do	46—Forster B	11,780	do do	do do

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timber.	Report and general remarks.
County.	Parish.				
Gloucester	Sutton and Thornton	71	2,240	Bloodwood, spotted and grey gum, forest mahogany, ironbark, and blackbutt.	Fairly timbered; superior quality.
Do	Stockton	171—Newcastle	600	Scrub	No cutting permitted; reserved with a view to protect scrub, which prevents sand from drifting into Newcastle harbour.
Gipps	Cadow	1,175—Cadow	1,250	Red gum and oak	Well timbered.
Do	Weelah and Yarnel	1,287—Weelah	3,840	Pine and gobborra box	do
Do	Ina	1,303—Ina	2,757¼	Box and pine	Fairly timbered.
Do	Merrimarotherie	1,359—Merrimarotherie.	3,200	Pine, box, belah, yarren, and budda.	Timber of inferior quality.
Do	Towyal	1,436—Towyal	345	Red gum	Fairly timbered; condition good.
Do	Towyal, Jemalong West, Wilbertroy, and West Plains.	1,581—Wilbertroy	12,800	Lachlan pine and oak	Well timbered; pine of advanced growth; none matured.
Do	Wamboyne	1,875—Wamboyne	3,000	Pine, belah, ironbark, and box	Fairly timbered.
Do	Moonbia	2,662	3,300	Gum, box, and bull oak	Well timbered; box of very good quality.
Georgiana	Rockley	43A	600	Stringybark, white box, red gum, and apple-tree.	Fairly timbered.
Do	Isabella and Beemarang	94	1,695	Stringybark	Fairly timbered; good quality.
Goulburn	Woomargama and Mountain Creek.	2,108—Mountain Creek.	7,900	Stringybark, white box, and white gum.	Well timbered; condition healthy.
Do	Hume, Woomargama, &c.	2,430—Woomargama.	13,000	Stringybark, mountain ash, messmate, red pine.	Well timbered; good quality.
Do	Mountain Creek	3,016	105	Stringybark, &c.	
Do	Pulletop and Forest Creek.	3,157	5,170	Stringybark	Thickly timbered; excellent quality.
Goulburn and Hume.	Buckargingah, Jerra Jerra, and Cookardinia.	1,743—Cookardinia A.	4,160	Stringybark, white gum, box, and apple.	Fairly timbered; inferior quality.
Goulburn and Selwyn.	Craven, Glenroy, and Yarara	2,422—Glenroy	13,700	Stringybark, euraba, messmate	Timber of good quality.
Goulburn and Mitchell.	Jerra Jerra and Pulletop	3,017	9,500	Stringybark and red box	Well timbered; superior quality.
Gough	Yarraford and Boyd	746—Ranger's Valley A.	130	Stringybark, red and white gum, and peppermint.	The nearest timber reserve to Glen Innes.
Do	do do	746— do B.	22,108	do do	do do
Do	Mount Mitchell and Llangothlin.	1,085	385	Stringybark, red and white gum	Fairly timbered.
Do	Robertson and Diehard	1,433	12,800	Tallow-wood, stringybark, red and grey gum, messmate, woollybutt, cedar, and sassafras.	Thickly timbered; very good quality.
Do	Wellingrove	1,555A	1,650		
Do	Macintyre	1,599	2,880	Stringybark and wattle	Heavily timbered; stringybark very good.
Do	Clive	1,185A	2,150		
Gordon	Belmore, Strathorn, Greenbank, and Hyandra.	1,096—Harvey's Range Creek.	38,400	Ironbark, stringybark, red and white gum, and yellow box.	Well timbered with trees in all stages of growth.
Do	Benya and Warraberry	1,365	6,480	Ironbark, stringybark, red and white gum, and white box.	Fairly timbered.
Do	Redbank	1,679—Redbank	1,100	Box, black pine	Fairly timbered; good quality
Gordon & Narromine.	Caloma and Belmore	1,117	2,880	Ironbark	
Do	Dubbo, Whylandra, and Dungary.	1,118—Sappa Bulga Range.	1,790	Pine, ironbark	Principally young timber.
Gowen	Eringanorin, Breelong, Biralbung, Mundar, Dilly, and Yalcogrin.	1,690	65,000		
Gresham	Buccarumbi	753	1,000	Spotted and red gum, ironbark, stringybark, pine, and oak.	Well timbered; quality fair.
Do	Urania & Springbrook	1,542	6,400	Cedar and Richmond pine	Adjoins reserve No. 254.
Do	Urania, Springbrook, & Barool.	1,608—Boyd River	24,960	Spotted, grey, and blue gum, mahogany, stringybark, tallow-wood, box, pine, ironbark, cedar, and rosewood.	Thickly covered with good timber in all stages of growth
Gregory	Dynong	1,069	840		
Do	Neinby	1,167	1,440	Pine, oak, and gum	Well timbered; in all stages of growth.
Do	Quilbone	1,173	1,920		
Do	Gandymungydel	1,355A	1,920	Pine and red or flooded gum	Thickly timbered; excellent quality.
Do	do	1,355B	2,150	do do	Fairly timbered; good quality.
Do	Quilbone	1,573	1,020	Pine, box, belah, yarren, leopard-wood, and rosewood.	do do
Hardinge	Williams	634	750	Stringybark and red gum	Fairly timbered; good quality.
Do	Barlow	635	1,500	Stringybark, ironbark, & red gum	Thickly timbered; good quality.
Do	Barlow	636	500	Stringybark and ironbark	do do
Do	Skinner and Williams	795	4,614	Stringybark and yellow box	Much of the timber has been injured by bush fires.
Do	Mackenzie	796	5,760	do do	Well timbered.
Do	Baker	877—Cameron's Crk.	3,200	Stringybark, ironbark, & red gum	do
Do	New Valley and Chigwell	878	4,540	Stringybark, messmate, woolly-butt, ironbark, and box.	Fairly timbered.
Do	Aston	939	600	Stringybark	Principally immature timber.

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timbers.	Report and general remarks.
County.	Parish.				
Hardinge	Yarrowick	990	2,188	Stringybark and red gum	A little pine and ironbark.
Do	Toryburn	991	2,200	Stringybark, ironbark, and yellow box.	Fairly timbered; not much timber cutting on this Reserve.
Do	Honeysuckle	1,016	1,120	Stringybark and box	
Do	Morse	1,129	280		
Do	Single and Clerk	1,261	4,000		
Do	Cameron	1,371	3,120	Ironbark	Timber of good quality.
Do	Toryburn	1,652	1,050		
Do		1,654	5,200		
Do	Skinner	1,683	1,210		
Do	St. George	1,684	2,560		
Do	Everett	1,689	1,450		
Hardinge & Inglis	Roumalla	719	7,000	White gum, red gum, stringybark, and cypress pine.	Well timbered.
Hardinge & Sandon	Sobraon and Sandy Creek	1,132	160	Stringybark	
Hardinge & Inglis	Balala, Roumalla, and Looanga.	1,537	6,400		
Harden	Bowning and Woolgarlo	1,561—Bowning	3,000	Stringybark, white box, and blue gum.	Fairly timbered; few matured trees.
Do	Jindalee	1,798—The Ironbarks	1,000	Ironbark and white box	do do
Do	Childowla	2,502	2,630	Stringybark and white box	do do
Do	Bookham, Birrema, and Talmo	2,514A	4,282	Stringybark, white box, and yellow box.	
Harden & Monteagle	Willawong, Marina, Moppity, and Douglas	2,393 — Douglas Range	6,496	Stringybark and white box	A fair growth of healthy young timber.
Hume	Morebringer	1,607—Morebringer	320	Blue gum and grey box	Lightly timbered.
Do	Gordon	1,714—Coreen	2,080	Pine, bull oak, grey box, and blue gum.	Few matured trees; young pine requires thinning.
Do	Collendina	1,788—Collindina	270	Flooded red gum and box	Thickly covered with healthy timber in all stages of growth.
Do	Collendina and Corowa	1,854— Travellers' Point.	720	Flooded red gum	do do
Do	Buckargingah	2,064—Buckargingah	912	Stringybark	Lightly timbered.
Do	Quat Quatta	2,068	29½	Red gum.	All matured timber of good quality; fairly distributed.
Do	Henty and Comer	2,201—Dudal Comer	5,120	Red gum, yellow and white box	Lightly timbered, fair quality; also reserved for water supply.
Do	Sandy Ridges	2,637	640	Pine	Young timber requires thinning.
Do	do	2,638	230½	do.	do do
Do	Henty	3,003	675¼	White box	Timber suitable for fencing material.
Do	Burrangong	3,108	355½	Pine, box	Pine, scrubby; box of fair quality.
Do	Sherwyn	3,117	200	Flooded gum	Timber of good quality in all stages of growth.
Do	Quat Quatta	3,125	47	Red gum	Very little timber of value.
Do	Sherwyn	3,248	45		
Hawes	Dewitt, Cobb, and Woko.	666	22,314	Box, apple, red, grey, and blue gum, stringybark, pine, blackbutt, turpentine, and cedar.	Thickly timbered in places; pine and cedar of excellent quality.
Hawes and Vernon	Fletcher, Salway, Shelving, Yarrawitch, Rushbrook, and Mukki.	1,293	38,880	Stringybark, blue gum, and messmate.	Thickly timbered; quality fair.
Hawes & Parry	Nundle, Dungowin, Yerrowin, Scott, Vant, and Myall.	1,541—Nundle	15,600	Stringybark and white gum	Very thickly covered with timber in all stages of growth.
Jamieson	Nundi, Bobbiwa, Tarlee, and Keera.	1,267—Tarlee	7,000		
Do	Woolabrar, Manamoi, Gehan, and Waterloo.	1,268—Eckford	26,800	Pine	
Do	Dobikin	1,571	120		
Do	Bunna	1,778	960		
Do	Bobbiwa	1,873	2,750	Pine, ironbark, gum, and belar	
Do	Bibel	1,883	160		
Jamieson and Murchison	Paleroo, Caroda, Pringle, Coryah, and Cowinanyarah	1,318—Rocky Creek	24,960	Stringybark, ironbark	Well timbered; fair quality.
Inglis	Scott and South Burke	899	3,000	Stringybark and red gum	Timber of fair quality; mostly young.
Do	Congi	918	2,500	Stringybark and gum	
Do	do	944	1,640	Stringybark and red gum	
Do	Moonbi and Perry	1,269—Moonbi	17,900	Red gum and stringybark	Fairly timbered; quality inferior.
Do	Winton	1,536	1,280	Stringybark and messmate	Well timbered; good quality.
Do	Congi	1,578	270	Stringybark and red gum	This in effect makes one reserve of Nos. 918 and 944.
Inglis & Vernon	Aberbaldie and Scott	897	560	Stringybark	Heavily timbered.
Do	Boulton and Scott	898	1,987		
Do	Ohio, Congi, & Bergen-op-Zoom.	1,008	2,000	Stringybark	Well timbered.
Inglis & Sandon	Sandon and Congi	1,253	800		
Kennedy	Wellwood & Cavendish	2,087	3,200	Pine, box, belar, and bull oak	Well timbered; good quality.
Do	Strathorn	2,092	3,000		
Do	Carolina	2,093A	3,600	Box, pine, and bull oak	A large quantity of good pine timber.

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timber.	Report and general remarks.
County.	Parish.				
Lincoln	Murrungundie, Bald Hill, and Yarrindury.	629A—Solitary	18,240	Ironbark, box, and pine	Fairly timbered; medium quality.
Do	Barbigal, Murrungundic, & Wooroboomie	629B	10,975	do do	do do
Do	Murrungundie&Narran	630—Murrungundie	4,370	Ironbark, box, and bull oak	The best of the timber has been cut.
Do	Bomely & Spring Creek	1,033	560	Ironbark	Difficult of access.
Do	Ballimore	1,034	1,600	Pine and Hardwood	Pine immatured; hardwood inferior.
Do	Bolaro	1,597	840	Ironbark and box	Fairly timbered; medium quality.
Do	Dubbo	1,671—Terramungamine, No. 1.	20	Gum, box, apple, and river oak	Within Dubbo population reserve, for shade and shelter.
Do	do	1,672—do, No. 2.	20	do do	do do
Do	Lincoln	1,688	9,920	Black & white pine and hardwood.	Pine immatured; hardwood fair
Do	Lincoln, Breelong, Breelong South, and Balladoran.	1,689	37,630	Ironbark and pine	Fairly covered with timber of present and prospective value.
Leichhardt	Willaga and Urawilkie	831—Urawilkie	2,600	Pine, box, gum, and forest oak	Timber of inferior quality.
Do	Moorambilla and Moolambong.	923—Warrana	6,300	Pine and box	Few matured pines; healthy growth of young timber.
Do		1,172—Six-mile Creek	1,280	Ironbark, pine, and blue gum	
Do		1,173—Urawilkie West	2,500	Pine, oak, box, and gum	
Do	Baronne and Carwell	1,416	5,040		
Do	Gilwarn and Devon	1,651	1,280	Pine, belah, and gum	Little matured pine; healthy growth of young timber.
Do	Gilwarny	1,652	1,280	do do	do do
Do	Coonamble	1,635	2,900		
Do	Carrabear	1,657	960	Pine, bimble box, bull oak, and carbeen.	Thickly timbered; good quality.
Do	Tooloon and Nelgourie	1,720	880		
Mitchell	Cuddell, Gillenbah, Wood, & Carobimilla.	1,890—Gillenbah	13,602	Black and white pine, box, and bull oak.	Pine, good quality; box and bull oak inferior.
Do	Milbrulong	2,722	4,800	Pine, white and yellow box, and bull oak.	Pine of fair quality.
Do	Wauberrima	2,936	3,300	Pine, white, and yellow box	Pine timber of fair quality; requires thinning.
Do	Burrandana & Westby.	3,063	8,307	Stringybark, red box, and gum	
Do	Mundowy & Berry Jerry	3,232—Berry Jerry	11,200	Red gum, white and yellow box, and bull oak.	Best red gum—timber cut.
Do and Wynyard	Livingstone, Burrandana, and Coffin Rock	3,293	12,800	Ironbark, stringybark	Well timbered; good quality.
Mitchell and Urana.	Waugh, Clyde, Wood, and Birrego.	3,053	8,320	Black and white pine, box, and bull oak.	The pine is of good quality; other timbers only suitable for fencing posts and fuel.
Macquarie	Queenslake, Burrawan	83 & 235—Cowarra A.	8,700	Tallow-wood, blackbutt, ironbark, flooded gum, grey and blue gum, brush box, forest mahogany, bloodwood, and turpentine.	Thickly covered with good timber in all stages of growth
Do	Queenslake, Burrawan, and Ralfe.	33—Cowarra B	8,320	do do	do do
Do	Cairncross & Redbank.	34—Redbank B	10,000	do do	do do
Do	Stewart	73	3,865	Tallow-wood, blackbutt, ironbark, flooded gum, grey and blue gum, brush box, forest mahogany, turpentine, bloodwood, stringybark, rosewood, beech, cherry-tree, and black apple.	Thickly covered with good timber in all stages of growth.
Do	Taree	80	250	Grey gum, cabbage gum, blackbutt, and ironbark.	Reserved for firewood and other public purposes.
Do	Beranghi and Lincoln	100—Maria	7,472	Turpentine, blackbutt, flooded gum, grey and blue gum, tallow-wood, forest mahogany, ironbark, stringybark, bloodwood, and brush box.	The best of the matured timber has been removed; but there still remains a large quantity of useful timber.
Do	John's River	144	14,000	do do	Thickly covered with good timber in all stages of growth.
Do	Kinchela	219 & 220—Fattorini Islands.	41	Brush	Reserved to prevent destruction of the brush; no timber of commercial value.
Do	Arakoon	221—Pelican Isds.	80	do	do do
Do	Macquarie	232—Brush	26	Brush box, blackbutt, tallow-wood, flooded gum, and turpentine.	No matured timber; reserved for shelter and the preservation of botanical specimens.
Do	do	233—Ocean	340	Tallow-wood, blackbutt, ironbark, flooded (blue and grey) gum, mahogany, bloodwood, turpentine, and brush box.	Fairly timbered; most of the matured timber pipey.
Do	Cairncross	234—Redbank A	610	do do	Thickly covered with good timber in all stages of growth.
Mouramba		1,187	1,280		
Do		1,196—Crowl Creek	640	Pine	
Do	M'Gregor and Yanko	2,523	2,430		
Do	Roset and Priory Plains	2,705	5,747½		Nearly all the timber has been removed for fuel.
Do	Flinders, Roset, Hartwood, Beloura, Hathaway, and Walker.	2,991	56,500	Pine and box	Well timbered; fair quality.

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timber.	Report and general remarks.
County.	Parish.				
Murchison	Delungra	954	2,500	Pine, ironbark, and box	
Do	Delingera	1,210	100		
Murchison and Nandewar.	Lindsay and Rusden	1,265—Lindsay	15,360	Stringybark and blue gum	Thickly covered with timber of good quality, in all stages of growth.
Manara	Younga South	475	2,880		
Monteagle	Murringo North and Dananbilla.	2,475—Dananbilla	1,200	Stringybark, ironbark, white box, mountain gum, Lachlan pine.	Well timbered; fair quality.
Do	Yundoo	2,503—Yundoo	1,100	Stringybark and white box	Fairly timbered.
Do	Wallawang and Gregullagung.	2,526—Calabash	1,800	Stringybark, white box, and Lachlan pine.	
Do	Bumbaldry	3,123	4,000	Ironbark, pine, stringybark, gum, and box.	
Murray	Canberra and Weetangera.	129	420	Stringybark, white gum, apple-tree, and yellow box.	Fairly timbered; quality good.
Do	Currandooly and Fairy Meadow.	162	2,420	Mountain ash	Quality good.
Do	Bywong	180	840	Brittle gum, blue gum, yellow box, and stringybark.	Timber suitable for fencing; large area ringbarked in neighbourhood.
Do	Palerang, Thurralilly, Jinero, Ballallaba, and Ollalula.	200	24,320		
Nicholson	Griffiths	2,831A—Corrigan's Ridge.	1,920	Pine, box, yarren, belar, and mallee	Timber inferior, but the large extent of treeless plain to the north and west renders the retention of the reserve desirable.
Do	Russell, Synnot, Moncton, and Chirnside.	2,865	5,936	Pine, box, gum, and yarren	A thick growth of pine, principally healthy young timber.
Nandewar	Durrisdeer, Deriah, and Billyena.	1,262—Billyeena	11,500	Pine and ironbark	Thickly timbered; no matured pine.
Do	Leard, Bollol, and Wean	1,263—Back Creek	22,400	do	Pine requires thinning.
Do	Narrabri	1,264—Narrabri	11,360	do	Thickly covered with timbe , in all stages of growth.
Narran	Not named	770	1,920	Gidgea and pine	Timber scarce in the surrounding district.
Do	Gunnawarra & Yarkieta	1,132	4,640		
Northumberland	Corrabaree & Congewai	46—Worrowolong	16,000	Blue gum, blackbutt, turpentine, forest mahogany, spotted and grey gum, stringybark, ironbark, and forest oak.	Very thickly timbered; splendid growth of blackbutt and blue gum.
Do	Belford	50A—Belford	2,832½	Spotted gum, ironbark, grey gum, and stringybark.	Healthy growth of young timber.
Do	Gosford	63—Hogan's Brush	990	Blue, spotted and grey gum, ironbark, forest mahogany, turpentine, forest oak.	Reserved for ornamental purposes and preservation of growth of indigenous jungle vegetation.
Do	Congewai, Stowe, Olney and Dora.	70—Olney	33,146	Blue, spotted, and grey gums, blackbutt, forest mahogany, tallow-wood, turpentine, ironbark, and forest oak.	Thickly covered with timber in all stages of growth.
Do	Mulbring and Teralba	69A—Sugarloaf	6,400	Spotted, grey, and flooded gum, forest mahogany, ironbark, stringybark, and turpentine.	Thickly timbered.
Do	Gosford, Kincumber, & Tuggerah.	124	4,160	White mahogany, spotted gum, red, blue, and grey gum, blackbutt, ironbark, and turpentine.	Timber of fair quality.
Do	Eglinton and Narara	128	1,280	Blue gum, turpentine, blackbutt, tallow-wood, cedar, coachwood, white and black pine, beech, sassafras.	Thickly timbered; blue gum, turpentine, and blackbutt of excellent quality.
Do	Ourinbah	129—Ourinbah	6,560	Turpentine, white and red mahogany, spotted, blue, and grey gum, turpentine, blackbutt, and ironbark.	A large quantity of good timber on this area.
Do	Narara	136	440		Reserved for public recreation and to preserve the timber, the locality being of great beauty.
Do	Wyong	143	2,000	Mahogany, grey, blue, red, spotted, and swamp gums, turpentine, and ironbark.	Timber of good quality.
Do	do	144	10,000	Mahogany, grey, blue, red, spotted, and swamp gum, turpentine, and ironbark.	Well timbered; good quality.
Pottinger	Doona	743—Doona A	5,120	Pine and ironbark.	Thickly timbered.
Do	do	743—Doona B	40	do do	do do
Do	Curlewis	1,027—Long Point West.	2,000	Pine	Timber of inferior quality.
Do	Trinkey and Calala	1,261—Trinkey	12,800	Pine and ironbark	Thickly timbered; good quality.
Do	Denison, and Denison West.	1,271—Denison	25,960	do do	do do
Do	Black Jack	1,644—Black Jack	900	do do	Thickly covered with young timber.
Do	Nea, Clift, and Breeza	1,665—(and part of Nea, 523).	19,380	do do	do do

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres	Description of principal kinds of timber.	Report and general remarks.
County.	Parish.				
Phillip	Price and Botobolar	30—Botobolar	5,120	Slatey and cabbage gum, stringybark, ironbark, and pine.	Timber cut from this land for over twenty years; that now remaining is inferior; also reserved for stone-quarry.
Do	Arthur and Dungeree	106—Apple-tree Flat.	18,474	Stringybark, ironbark, red and blue gum, and box.	Timber of fair quality.
Do	Wollar	125	120	Box, slatey and red gum, stringybark, and apple-tree.	Timber of good quality; fairly distributed over the area.
Do	Moolarben	128	264½	Slatey and red gum, ironbark, and stringybark.	A few useful trees; young timber requires thinning.
Parry & Vernon	Ainsley, Vernon, and Aberbaldie.	896	3,997½	Stringybark	Well timbered; good quality.
Do	Walcha and Glen Morrison	1,277	400	do	Fairly timbered.
Do	Ingleba and Walcha	1,282			
Richmond	Tatham	45A—Tatham	640	Stringybark	Timber of fair quality.
Do	Busby and Mongogarie.	246A	19,200	Stringybark, bloodwood, turpentine, gum, and box.	Thickly covered with good timber in all stages of growth.
Do	West Coraki and Ellangowan.	625—Coraki	5,400	Blackbutt, red gum, mahogany, ironbark, messmate, swamp and forest oak, and flooded gum.	do do
Do	Gibberagee and Tabimoble	894	6,400		
Do	Donaldson and Doubleduke.	895A	7,680	Red and white gum, blackbutt, bloodwood, mahogany, ironbark, tallow-wood, apple-tree, yellow box, tea-tree, and forest oak.	Well timbered; good quality.
Do	Myrtle	973	1,200	Spotted, red, and white gums, ironbark, blackbutt, yellow box, and mountain ash.	Thickly timbered; fair quality.
Do	Ellangowan and Darke	974—Nandabah	3,700	Spotted, blue, and red gums, blackbutt, ironbark, box, forest oak, mahogany, tea-tree, and apple-tree.	The matured trees are of fair quality; young timber healthy and good.
Do	Riley	1,037	1,200		
Do	Darke, Ellangowan, and West Coraki.	1,137	12,800	Stringybark, grey gum, ironbark, bloodwood, tallow-wood, blackbutt, and red gum.	Lightly timbered; medium quality.
Do	South Ballina	1,175	250		
Raleigh	Unkya	70—Unkyra	3,200	Flooded, blue, and grey gum, blackbutt, tallow-wood, turpentine, red and forest mahogany, box, ironbark, and forest oak.	Very thickly covered with timber in all stages of growth
Do	Newry, Valley Valley, and Nambucca.	111—Nambucca	22,959	Hardwood	Timber of good quality.
Robinson	Weltre, Yanda, Narri, Rochford, Bee, and Rankin.	633	62,080	Pine and box	Reserved for fuel.
Do	Nullemut, Mopone, Kaloogliguy, and Billagoe.	634	16,640	do	do
Do	Nyngan, Linton, Canbeligo, Hoskins, and Davies.	635	64,000	do	do
Rous		38—(six islands in Richmond River, and twenty-two islands in Tweed River).	2,360	Oak, pine, bangalow, gum, and mangrove.	Thickly timbered; this foliage is of great beauty and ornamental to the river; timber reserved to prevent the banks of the islands from being washed away.
Do	North Lismore and Dunoon.	249—Terania Creek	24,260	Pine, beech, bean, ironbark, red gum, cedar, rosewood, mahogany, blackbutt, stringybark, and brushwood.	Very thickly covered with timber in all stages of growth
Do	Nullum	250—Tweed River.	22,400	Bean, beech, cedar, bloodwood, blue gum, pencilwood, rosewood, and tallow-wood.	do do
Do	Not named	251—Macpherson Range.	56,320	Red gum, mahogany, Moreton Bay pine, beech, quondong, box, cedar, pencilwood, rosewood, oak, bloodwood, ironbark, bean, stringybark, tallow-wood, and brush timber.	do do
Do	North Casino	255—Casino A	2,560	Red and spotted gum, tallow-wood, stringybark, ironbark, box, blackbutt, bloodwood, and peppermint.	Fairly timbered; good quality
Do	Do	255—Casino B	38	do do	do do
Do	Terania	256—Chindera	396	Quondong, beech, bean, pencilwood, cedar, and rosewood.	Thickly timbered; condition good.
Do	Cudgen	257—Cudgen	616	Beech, pencilwood, rosewood, bean, cedar, teak, and bloodwood.	do do
Do	Newribar	258—Broken Head	1,280	Red gum, beech, Moreton Bay pine, cedar, tallow-wood, honeysuckle, teak, flooded gum, blackbutt, ironbark, box, and mahogany.	do do
Do	In Tweed River	335—Stott's Island	350	Bean, flooded gum, cedar, beech, white cedar, swamp oak, silky and forest oak, tea-tree, and scrub timber.	Thickly timbered; reserved for ornamental purposes, and to protect the island from the action of river.

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timber.	Report and general remarks.
County.	Parish.				
Rous	Newribar	768—Tintinbar	160		
Do	Meerschaum & Pimlico	864—Uralba	930	Ironbark, gum, and blackbutt	Fairly timbered; good quality
Do	Brunswick, Mullumbimby, and Jaspar.	1,029	4,860		
Do	Jaspar and Clunes	1,030	5,840		
Do	Tucombil	1,033	1,600		
Do	Billimidgel, Mooball, and Cudgen.	1,034	14,220		
Do	Seven	1,036	46		
Do	Berwick	1,123	1,980		
Do	do	1,125	448		
Do	Seven	1,126	312	Teek, beech, and cedar	Very little timber of value; also reserved for water supply and public purposes.
Do	Meerschaum	1,127	250		
Do	Coughal, Unumgar, and Findon.	1,152	19,200		
Do	Brunswick	1,164	2,800		
Do	Terranora	1,165	2,300		
Do	do	1,166	500		
Do	do	1,167	1,100		
Do	Dunoon	1,168	640		
Do	do	1,169	150		
Do	do	1,170	80		
Do	Kynumboon	1,171	4,000		
Do	Dunbible	1,172	1,800		
Do	Lismore	1,173	810		
Do	Berwick	1,174	5,140		
Do	Tunstall	1,176	290		
Do	Murwillumbah	1,177	2,800		
Do	Ballina	1,178	43		
Do	do	1,179	170		
Do	do	1,180	170		
Do	Meerschaum	1,181	300		
Do	do	1,182	180		
Do	do	1,183	190		
Do	Wollumbin	1,184	800	Cedar, teek, blue gum, and ironbark.	Thickly timbered.
Do	do	1,185	1,700	Cedar, teek, beach, gum, fig, and bean.	do
Do	Billinudgel	1,186	9,900	Cedar, pine, beech, ironbark, and bloodwood.	do
Do	Seven	1,187	50		
Do	do	1,188	600		
Do	do	1,189	150		
Do	Newribar	1,190	3,000		
Do	Pimlico	1,191	50		
Do	do	1,192	200		
Do	Tuckombil	1,193	300		
Do	do	1,194	80		
Do	do	1,195	100	Tallow-wood, gum, and beech	Lightly timbered.
Do	do	1,196	180	do do	Scrubby.
Do	do	1,197	200	White gum, blackbutt, and beech	A few small cedar trees on this reserve.
Do	Byron	1,198	5,000	Blackbutt, woollybutt, gum, ironbark, and pine.	Timber of fair quality.
Do	Jasper and Byron	1,199	6,400		
Do	Whian Whian	1,200	1,920	Cedar, bloodwood, teek, and ironbark.	Timber mostly scrubby.
Do	Bexhill	1,201	115	do do	do
Do	do	1,202	120	Cedar, bloodwood, ironbark, and teek.	
Do	do	1,203	900	do do	
Do	Tuckombil	1,211	130	Hardwood	Lightly timbered.
Roxburgh	Cullen Bullen	60	4,533	Stringybark, mountain ash, blackbutt, and red gum.	Thickly timbered; good quality.
Do	Wills, Clandulla, and Mead.	64	2,880	Stringybark, ironbark, and red gum.	Fairly timbered.
Do	Jesse	77	5,120	Blackbutt, white gum, and stringybark.	Fairly timbered; within a restricted gold-field.
Sandon	Exmouth and Tilbuster	880	3,840	Stringybark and red gum	Well timbered with stringybark of very good quality.
Do	Wentworth & Clevedon	881	4,760	do do	Well timbered; stringybark of superior quality.
Do	Springmount, Wentworth, and Tilbuster.	929	3,609	Stringybark	do do
Do	Boorolong and Dumaresque.	1,023	7,698	do do	do do
Do	Boorolong	1,024	3,940	Stringybark	Well timbered; good quality.
Do	Enmore and Merigalah.	1,040	3,200	Stringybark, red gum, and black wattle.	Heavily timbered; fair quality.
Do	Hillgrove	1,251	1,483	Stringybark and red gum	Well timbered.
Do	Albert and Dumaresque	1,264	800	Stringybark, red gum, and yellow box.	Stringybark fair; other timbers inferior.
Do	Urotah	1,419	1,200	Stringybark and black wattle	Well timbered; fair quality.
Do	Enmore	1,429	4,350	do do	do do
Do	Enmore and Merigalah	1,487	3,400	Stringybark, white box, and red gum.	do do

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timber.	Report and general remarks.
County.	Parish.				
Sandon and Vernon.	Eastlake, Lawrence, and Enmore.	1,430	9,060	Stringybark, black wattle, yellow box, and red gum.	Principally immature timber.
St. Vincent	Currambene and Nowra	33—Currambene A	4,480	Spotted gum, bloodwood, blackbutt, stringybark, peppermint, ironbark, &c.	Thickly covered with healthy timber in all stages of growth.
Do		33—Currambene B	5,920	do do	do do
Do	Yerriyong and Jerriwangala.	44—Turpentine Range.	10,880	Turpentine, messmate, bloodwood, ironbark, blackbutt, &c.	About one-fifth of the area embraces timber of commercial value.
Do	Farnham and Cudmurah.	45—Red Head	23,800	Bloodwood, spotted gum, blackbutt, mahogany, turpentine, and ironbark.	About half the area embraces timber of commercial value.
Do	Tomaga, Mullendarry, and Mogendoura.	99—Tomaga	6,000	Spotted and red gum, box, stringybark, blackbutt, ironbark, mountain ash, and peppermint.	Timber of commercial value evenly distributed over whole area.
Do	Albert, Benandra, Bolaro, Boyne, Buckenbowra, Clyde, Currock, Currowan, East Nelligen, Kioloa, Milo, Mogood, Monga, Murrengenburg, Termeil, and West Nelligen.	103—The Nelligen.	197,683	Spotted, blue, red, and mountain gums, messmate, bloodwood, stringybark, ironbark, blackbutt, woollybutt, mahogany, turpentine, and sassafras.	Heavily timbered with matured and fine healthy young trees of splendid quality; embraces the best-timbered land south of Sydney.
Do	Conjola	115	51	Turpentine, bloodwood, ironbark, and stringybark.	Thinly timbered; few matured trees.
Do	Monga and Coghill	122	13,000	Mountain ash, messmate, mountain gum, sassafras, stringybark, and blackwood.	Thickly covered with timber in all stages of growth.
Do	Yadbro, Croobyar, Endrick, Corang, &c.	123	215,179	do do	About one-third of the area embraces timber of commercial value; reserved pending surveyor's report; large area very rugged.
Do	Woodburn	129—Burril Lke	500	Blackbutt, bloodwood, stringybark, spotted gum, and turpentine.	Timber of little value; reserved principally to secure access to Burril Lake.
Selwyn	Maragle and Tooma	2,104	4,000	Stringybark, white box, and white gum.	Stringybark fair; other timbers useless.
Do	Maragle	2,106	2,760	do do	do do
Do	Bogandyera & Welaregang.	2,382—Welaregang	21,760	Stringybark, messmate, blue and white gum.	Fairly timbered.
Do	Burra, King, and Beaumont.	2,538—Burra Creek	7,998	Blue gum, messmate, mountain ash, and stringybark.	Timber of superior quality.
Do	Maragle and Hay	2,855	1,950	Stringybark	
Selwyn and Wynyard.	Hillas, Bago, Selwyn, Courabyra, King, Buddong, Hindmarsh.	1,961—Bago A	58,000	Mountain ash, messmate, stringybark, &c.	Thickly timbered; good quality.
Do	Battoro, and Yellowin	1,961—Bago B	6,000	do do	do do
Stapylton	Careunga	1,306	2,700	Belah	Thickly timbered.
Sturt	Bringagee, Wowong, and Benerambah.	2,989—Wowong	4,200	Red gum and box	Red gum of good quality; box inferior.
Do	Benerambah	2,990—Benerambah	600	do do	do do
Tara	Moorna	383—Moorna	305	Pine	Timber in clumps; reserved for shade or shelter.
Do	Taranga	525	295		
Townsend	Mundiwa	1,404—Deniliquin	1,920	Murray pine, box, and myall	Well timbered; a few matured pines.
Do	Ronald	1,458—Uroley	3,400	Murray pine and box	Fairly timbered; few matured pines.
Do	Banangalite, Morago, Kerranakoon.	1,792—Morago	4,800	Flooded red gum	Well timbered.
Do	Conargo	1,849	930	Flooded red gum, Murray pine	do
Do	Palmer	1,851	1,280	Flooded red gum, Murray pine, and box.	Pine thinly scattered; box inferior.
Do	Dunkeld	1,879—Steam Plains No. 1.	1,080	Murray pine and myall	Fairly timbered; dense growth of young pine; scrub has been cleared off under supervision.
Do	Moultrassie	1,880—Steam Plains No. 2.	3,840	Murray pine	do do
Do	Edgar	1,901	1,941¾	do	Thinly timbered; do
Do	Campbell	1,902	1,239½	do	Well timbered; condition good.
Do	Banangalite	3,031	651	Flooded red gum	
Do	Edgar	3,156	800	do	
Do	Boyeo and Nallam	3,263-Gulpa Island	13,500	do	
Do	Derulaman	3,264—Tuppal	4,200	do	
Do	Towool, Bullatella, Coronalla, Bungooka, Tawarra, Narratoola, and Wonnue.	3,265—Millewa	68,580	do	
Townsend and Wakool.	Balpool, Werai, Colimo, and Tumudgery	3,262—Edward River	38,500	do	
rana	Yamma	1,456—Yamma	1,920	Box and pine	Reserve well timbered, situated upon a large bare plain; scrub destroyed; young trees and saplings thinned out to about 12 feet apart; lower branches of pines cut off to a height of about 4 feet from ground.

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timber.	Report and general remarks.
County.	Parish.				
Urana	Broome	1,648—Broome	320	Pine, box, and red gum	Fairly timbered.
Do	Butherwa	1,695—Brookong	4,800	Pine (white and yellow), box, and bull oak.	This reserve has been thinned out under permission.
Do	Waloona	1,716—Waloona	1,280	Pine	Well timbered; principally young trees.
Do	Yanko South	1,778	282¼	Pine and box	Fairly timbered.
Do	do	1,779	551¾	do	do do
Do	do	1,780	1,256	do	do do
Do	Morundah	1,799—Colombo's Piney Ridge A.	10,080	do	Large quantities of young pine; requires thinning.
Do	do	1799—do B	240	do	do do
Do	Clyde and Morundah	1,833—Morundah	11,630	Pine, white and yellow box, and bull oak.	A fair quantity of good matured pine; young pine healthy, but requires thinning.
Do	Yanko	1,835—Kulkic	1,075	Pine, box	A good growth of pine; box inferior.
Do	Widgiewa and Urana	2,049	465¾	Pine, white box, yellow box, and red gum.	Fairly timbered.
Do	Widgiewa	2,103—The Boundary Gums.	40	Gum	A few trees reserved as a camping place on a large plain.
Do	Yanko	2,138	508	Pine	Fairly timbered.
Do	do	2,139	1,023	do	A fair quantity of useful timber.
Do	Palmer	2,216	1,500	do	do do
Do	do	2,217A	1,760	do	do do
Do	Osborne	2,317A	10,216	do	Well timbered; pine saplings thinned out to a distance of 12 feet; box timber ringbarked before reserve was made.
Do	do	2,317B	11,425	do	do
Do	Mairjimmy	2,587	3,100	Pine and grey box	Thickly timbered; reserved for supply of fuel.
Do	Booroobanhilly	2,588	3,380	do	do do
Do	Lake Morunda South, Mucra, and Piney Ridge.	2,598	5,283¾	do	do do
Do	Clyde and Boree Creek	2,613	7,950	Pine, white and yellow box, and bull oak.	A fair quantity of good pine. This reserve borders an immense plain.
Do	Boreegerry, Palmer	2,696	6,720	Pine, bull oak	Fairly timbered; medium quality timber of any kind scarce in locality.
Do	Butherwa	2,762	1,760	Pine, white and yellow box, and bull oak.	Fairly timbered.
Do	Clear Hill	2,925	1,900	Pine	Thickly timbered with young pines.
Do	Gunambil	3,052A	296½	Pine, bull oak, box, and gum	Well timbered.
Do	Palmer	3,105	3,340	Pine	Thick growth of young pine.
Vernon	Emu and Fenwick	931—Big Hill	1,440	Stringybark	Heavily timbered.
Do	Boulton	1,006	1,560	Stringybark	Well timbered; good quality.
Do	Fenwick	1,124	1,200	Stringybark and red gum	do do
Do	Shelving	1,125	1,170	do do	Fairly timbered; good quality.
Do	do	1,126	720	Stringybark, red gum, and black wattle	Fairly timbered.
Do	Ella and Winterbourne	1,204	7,500	do do	do
Do	Winterbourne, Gill, & Ella	1,354	25,600	Stringybark, box, and black wattle	Thickly timbered; stringybark very good.
Do	Norton	1,616	1,100	Stringybark	Timber of good quality.
Wakool	Noorong, Gonn, Moorongatta, Belmore, Cobwell, Beremegad	1,445A—Wakool A	21,982⅝	Flooded red gum and box	Well timbered, with red gum along bank of river.
Do	Noorong	1,445A—Wakool B	350	do do	
Do		1,454	1,600	Low scrub	Reserved for shade.
Do		1,786—Mellool	5,440	Flooded red gum and box	Well timbered, with red gum on bank of river and on flooded flats.
Do	Wetuppa and Coobool	1,787—Jeegur	11,960	Flooded red gum	Well timbered; good quality.
Do	Boyd, &c.	1,789—Neimur A	29,649	Flooded red gum and pine	No matured pine; red gum in all stages of growth fringing the river and on the flats.
Do	Boyd	1,789—Neimur B	1,850	do do	
Do	Yarrein, Kyalite, Moolpa, Liewa, &c.	1,790—Edward River (extension of)	10,835	Flooded red gum	Fairly timbered; medium quality.
Do	Mallee	1,834	10	do do	Timber of good quality.
Do	Thelaka	2,032—Thelaka	696	Pine	Fairly timbered.
Do	Mallee and Millen	2,046	3,200	Flooded red gum	Well timbered.
Do	Nunnagoyt	2,066—Campbell's Island.	6,220	do	Thickly covered with good timber.
Do	Belmore	2,887	312½		
Do	Wetuppa	3,103	5,000	Pine, willow, dogwood, and box	Contains some of the best pine in the district.
Do	Gonn, Nunnagoyt, Barham, Whymoul, Danberry, Cangan, & Tiltil.	3,258—Koondrook No. 1.	80,000	Red gum	
Do	Gnuie	3,259—Koondrook No. 2	1,820	do	

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timber.	Report and general remarks.
County.	Parish.				
Wakool	Mellool	3,260—Koondrook No. 3	2,760	Red gum	
Do	do	3,261—do No. 4	2,240	do	
Do	Nunnagoyt	3,268	5,200	do	
Wallace	Myalla	204A—Myalla	1,600	White gum, peppermint, and bastard box.	Timber only suitable for fuel.
Do	Wullwye	233—Wullwye	960	White and cabbage gum	
Do	The Peak	335A	400	Peppermint, white, and cabbage gum.	Thickly wooded; inferior quality.
Do	do	335B	250	do do	do do.
Do	Gordon	379	700	Cabbage gum and white gum	Lightly wooded; inferior.
Do	Wallgrove	433	260	White gum, sallee, and peppermint	Reserved for fuel; thickly timbered.
Do	Coolamatong	517	336	White gum and peppermint	Thickly timbered; inferior quality; for fuel.
Do	Buckenderra	523	1,280	White gum and sallee	Fairly timbered.
Do	Gordon	678	110	White and cabbage gum	Fairly wooded; inferior.
Do	Beloka	720	870	do do	Lightly timbered; medium quality.
Do	Marrinumbla	726	526½	do do	do do.
Do	Adaminaby	760	500	White gum	For fuel.
Do	Coonhoonbulla	818	500	White gum and bastard box	Lightly timbered; fair quality.
Do	do	819	1,100	Pine, white gum, and black wattle	Timber of medium quality.
Do	Cabramatta and Chippendale	822	3,300	Mountain ash and white gum	Well timbered; medium quality.
Do	Numbla	827	600	Cabbage and white gum	Thickly wooded; inferior.
Do	Matong	833	480	White gum and peppermint	Well wooded; fair quality.
Do	Townsend	901—Jinderboine	500	Cabbage and white gum	Fairly timbered; inferior.
Do	Arable and Myalla	902	950	Peppermint and white gum	For fuel.
Do	Eucumbene and Middlingbank	956	720	Cabbage and white gum and black wattle	Thickly wooded; good.
Warradgery	Dowling	1,623—Shellangering	2,400	Gum	Country south of reserve destitute of timber.
Do	Ulonga	1,823—One-tree	½		A landmark on an immense plain.
Westmoreland	Konangaroo & Genolan	22—Council Chambers Flat	15,360	Blackbutt, white gum, peppermint, mountain ash, white box, and stringybark	About two-thirds of the area embraces valuable timber.
Do	Alfred and Bindo	23—Lippy's Creek	11,520	Mountain ash, grey gum, peppermint, blackbutt, and stringybark	The whole area is fairly covered with valuable timber in all stages of growth.
Do	Balfour and Swatchfield	36	1,160		
Do	Bindo	83—Bindo	1,520	Blackbutt, mountain ash, stringybark, and grey gum	About two-thirds of the area embraces valuable timber.
Do	Vulcan, Mozart, and Balfour	90	7,000	Mountain ash, blackbutt, and gum	Timber fairly distributed, and of good quality.
White	Gurleigh	1,788	2,000	Pine, ironbark, and box	Well timbered; quality good.
Do	Quinn and Mollea	1,273—Robertson B	5,060	do do	Thickly covered with timber of good quality in all stages of growth.
Wynyard	Murraguldrie and Kilgowla	1,705—Murraguldrie	14,000	Stringybark, red gum, white box, and cabbage gum	Thickly timbered, quality good; saplings require thinning.
Do	Gregado and Woomahrigong	1,871	1,280	Hardwood.	
Do	Gregado	1,872	640	Ironbark and stringybark	
Do	Livingstone	1,873A	1,280	do do	The young stringybark requires thinning.
Do	do	1,873B	880	do do	do do
Do	Woomahrigong	1,874A	1,920	Ironbark, stringybark, yellow and white box, and red gum.	Thickly timbered; medium quality.
Do	do	1,874B	1,920	Ironbark and stringybark	Fairly timbered; medium quality.
Do	Bulalgee and Carabost	1,918—Carabost A	22,400	Stringybark, red gum, white box, and yellow box.	Well timbered; good quality.
Do		1,918—Carabost B	4,000	do do	do do
Do	Ellerslie, Green Hills, Dutzon, and Hillas.	2,040—Adelong	79,670¾	Stringybark, apple-tree, cabbage gum, grey and blue box, and messmate.	Fairly timbered; required for mining purposes.
Do	Euadera	2,097—Euadera	8,786	Stringybark, apple-tree, white box, and red mountain gum.	do do
Do	Woomahrigong	3,009	2,960	Stringybark and ironbark	No matured timber.
Wellesley	Maffra	250—Maffra	3,100	Bastard box, cabbage gum, and pine.	Thinly timbered; inferior quality; timber of any kind scarce in neighbourhood.
Do	Burnima	270—Burnima	206	White and cabbage gum	Thinly timbered; required principally for fuel.
Do	Burrimbucco	282A—Burrimbucco.	4,000	Messmate, white ash, ribbon and cabbage gum.	Timber in patches; quality fair.
Do	Cathcart	322—Cathcart	120	Messmate and white and cabbage gum.	Fairly timbered; medium quality.
Do	Thoko and Wellsmore	343—Ando Hill	640	Cabbage and white gum	do do
Do	Ironmungy	356—Ironmongy	200	White gum, bastard box	do do
Do	Wangellie	366A—Gunning Grach	658	White gum	do do
Do	do	366B— do	151½	do	do do
Do	Boco	382	1,340	Cabbage and white gum	do do
Do	Wellsmore	384—Thoko	570	Blackbutt, messmate, and white gum.	Thickly timbered.
Do	Bungarby	390—Bungarby	1,280	Cabbage gum, dwarf box, and peppermint.	Fairly timbered; timber only suitable for fencing-stuff and fuel.
Do	Gecar	411—Gecar	420	Cabbage gum and honeysuckle	Thinly timbered.

SCHEDULE J—*continued.*

Locality.		Number and name of reserve.	Area in acres.	Description of principal kinds of timber.	Report and general remarks.
County.	Parish.				
Wellesley	Cambalong	422	1,100	Cabbage gum, white gum, and peppermint.	Thickly wooded; poor quality.
Do	Bunarby and Peters	428—Snowy River	4,500	Bastard box, cabbage gum, pepermint, and pine.	Fairly timbered; medium quality.
Do	Cathcart	457	240	Cabbage gum, white gum, and pepermint.	Thickly wooded; inferior quality.
Do	Nelson	491	40	White gum and peppermint	Reserved for fuel.
Do	Hayden	727	5,100	Cabbage, white gum, and peppermint.	Thickly covered with timber of fair quality.
Do	Hayden	728	370	Cabbage gum, peppermint, and a little stringybark	Thickly timbered; poor quality.
Do	Jettiba	747	300	Peppermint, white and cabbage gum.	Timber only suitable for fuel.
Do	Ashton	828A	750	White gum, peppermint, and black wattle.	Well timbered; fair.
Do	Meringo & Merriangaah	874—Bald Hill	2,350	Ribbon gum, peppermint, white gum, and bastard box.	The only timber of commercial value is ribbon gum.
Do	Burrimbucco and Coolumbooka	905	360	Messmate, mountain gum, and pepermint.	Fairly timbered; medium quality.
Do	Lawson	1075	4,000	Ash, messmate, gums, and peppermint.	Heavily timbered; scrubby; good quality.

SCHEDULE K.

FOREST RESERVES proclaimed as exempted from the operation of the ordinary timber licenses issued under the Timber Regulations of 24th September, 1878.

Timber cut upon these Reserves is subject to license fees, payment of royalty, and the conditions specified in the State Forest Regulations, or in the regulations applying to the Timber Reserves:—

County.	Parish.	Number of Reserve.	Area in Acres.
Ashburnham	Wangen	2,030	190
Auckland	Cobra and Yuramine	337	1,960
Auckland and Wellesley	Mila, Lawson, Gulgin, and Bondi	385	1,440
Auckland	Weriberi	991	1,000
Do	Mumbulla, Bega, and Brogo	996	350
Do	Mumbulla	1,003	3,000
Baradine and White	Belmore, Coghill, Cook, Cap, Mollee, Gowie, Bohena, Quinn, Boral, Merrimborough, Anson, Dampier, and Nuable	1,273	151,400
Bathurst	Tintern	184	2,923
Benarba	Banarway	814	2,500
Beresford	Murrumbucka	266	960
Do	Bulgundramine	287	2,500
Do	Gladstone	438a	20½
Bland and Harden	Congon and Jindalee	1,274	3,260
Bland and Monteagle	Euroka, Marowie, Bimbi, and Weddin	1,855	34,560
Bligh	Warung and Gunna	142	1,970
Do	Warung	143	2,150
Bligh, Pottinger, and Napier	Brennan, &c.	646	6,720
Bourke	Berrembed	281	1,760
Do	Ganmain	303a	1,920
Do	Kindra and Coolamon	892	34,675
Do	Hook, Ganmain, and Kockibertoo	1,251	9,246
Do	Elliott, Kockibertoo, and Matong	1,421	13,280
Do	Robertson	1,439	25,555
Do	Ashbridge, Dulah, and Devlin	2,652	62,000
Brisbane	Watt and Campbell	95a	3,602¾
Boyd	Uri	180	1,400
Do	Cararbury	182	1,280
Do	Coleambally	1,731	1,566
Do	Argoon	1,754	1,692½
Do	Mygotha	1,755	640
Do	do	1,756	1,052½
Do	do	1,757	538
Do	Gunnanbrennan	1,884	937
Do	Cararbury	1,905	2,240
Do	Waddi	1,997	1,207½
Do	do	2,258	1,200
Buccleuch	Adjunbilly and Wyangle	3,177	14,000
Cadell	Moama and Bama	3,252	6,500
Do	Bama, Gulpa, and Moira	3,253	37,000
Do	Toorangabby, Tomara, Burrumburry, Tantonan, and Thule.	3,254	51,000
Do	Perricoota	3,255	810
Camden	Wollongong	38a	580
Do	Burrawang	43a	59
Do	Wonona, Dendrobium, and Cordeaux	57	24,500
Do	Jamberoo and Kiama	78	202
Do	Jamberoo	112	200
Do	Wallaya	119	4,840
Do	Bunberra	120a	150
Do	do	121a	120

SCHEDULE K—*continued.*

County.	Parish.	Number of Reserve.	Area in Acres.
Camden	Wallaya and Broughton	122	440
Do	Yarrawa and Burrawang	154	1,700
Do	Broughton	155	15
Do	Do	156	52
Do	Do	157	60
Do	Broughton and Wallaya	168	2,968
Do	Cambewarra	172	170
Do	do	173	100
Do	Cambewarra and Bunberra	174	350
Do	Jamberoo and Kangaloon	175	1,600
Do	Cambewarra	209	1,000
Do	do	231	370
Cook	Irvine	33	160
Do	do	201	61
Do	do	202	28
Clarke	Big Hill, George, Clarke, Geogla, Styx, Serpentine, and Cunnawarra.	1,662	45,000
Do	Snowy and Serpentine	1,663	17,000
Clarence	24 islands in Clarence River	38	1,184
Do	Banyabba, Richmond, and Laurence	242	16,000
Do	Tyndale, Cunoulum, and Coldstream	243	16,000
Do	Glen Ugie	244a	8,320
Do	Chapman	245a	12,800
Do	Great Marlow	260	71
Do	Southgate	353	4,480
Do	Woodford	394	20
Cumberland	Gordon	97	106
Do	Bulgo and Heathcote	110	5,742
Courallie	Weebullabulla, Menandool, and Bundowithidie	948	800
Do	Carore	1,059	2,700
Cooper	Grong Grong	310	2,240
Do	Binya, Binga, and Stanbridge	2,740a	30,000
Do	Coolararagang and Cuba	2,984	1,020
Do	Cuba and Hulong	2,985	5,098
Do	Dallas	2,986	300
Do	Dallas, Gogeldrie, and Yarrangery	2,987	6,560
Do	Yarrangery	2,988	3,820
Do	Coolarogang	2,992	880
Do	Dallas	2,993	2,200
Do	Barralong	3,037	3,200
Clarendon and Harden	Burra, Muttama, Mitta Mitta, and Ullandra	2,284	1,920
Dampier	Bodalla	249	380
Do	Wagonga	307	8,040
Drake	Fairfield and Timbarra	248	31,360
Do	Mookimer and Rodham	379	10,365
Drake and Richmond	Pickapene, Alice, Coongbar, Ulyon, and Busby	379	10,365
Denison	Cottadidda	107	270
Do	Wahgunya	1,591	4,120
Do	Warmatta	1,592	640
Do	Boomanoomana	1,639	400
Do	Dry Forest	1,656a	560
Do	Turramia	2,386	420
Do	Waamatto	3,144	740
Do	Mulwala and Turramia	3,208	1,340
Do	Boomanoomana	3,209	960
Do	do	3,210	2,100
Do	do	3,211	108
Do	Cottadidda	3,212	300
Do	do	3,213	280
Do	do	3,214	150
Do	Barooga	3,215	2,500
Do	Mulwala and Turramia	3,216	4,396¼
Do	Cottadidda	3,240	105
Do	Tocumwal	3,241	400
Do	Woperana	3,242	360
Durham	Goorangoola	79	1,184
Do	Dyrring and Broughton	195	1,250
Do	Mount Royal and Liebeg	196	10,000
Dudley	Cunnawarra, Comara, Lignum, and Nulla Nulla	158	80,000
Ewenmar	Calargambone	1,555	500
Do	Warrie	1,556	1,480
Ewenmar and Gregory	Galargambone and Tailby	1,138a	1,040
Fitzroy	Ermington	259	3,200
Do	Moonpar, Cope, Wirriri, Jardine, and Herborn	354	48,000
Do	Tyringham and Dorrigo	355	5,760
Do	Bellinger, Coff, Macleay, and Moonee	642	16,000
Fitzroy and Raleigh	Allan Water, Vautin Allan, Raleigh, Leigh, and Bostobrick	377	52,480
Forbes	Morongla	1,143	5,440
Do	Jemalong	1,724	610
Gloucester	Terarec, Batchelor, &c.	29	217,600
Do	Talawahl and Beryan	46	18,490½
Do	Stockton	171	600
Gipps	Cadow	1,175	1,250
Do	Weelah and Yarnel	1,287	3,840
Do	Ina	1,303	2,757¼
Do	Towyal	1,436	345
Goulburn	Jerra Jerra and Cookardinia	1,743	4,160
Goulburn and Mitchell	Jerra Jerra and Pulletop	3,017	9,500
Gough	Yarraford and Boyd	746	130

SCHEDULE K—*continued.*

County.	Parish.	Number of Reserve.	Area in Acres.
Gordon	Belmore, Strathorn, Greenbank, and Hyandra	1,096	38,400
Gordon and Narromine	Caloma and Belmore	1,117	2,880
Do	Dubbo, Whylandra, and Dungary	1,118	1,790
Gowen	Eringamorin, Breelong, Biralbung, Mundar, Dilly, and Yalcogrin.	1,690	65,000
Gresham	Urania and Springbrook	1,542	6,400
Do	Urania, Springbrook, and Barool	1,608	24,960
Gregory	Gandymingadel	1,355	1,920
Hardinge	Ashton	939	600
Harden	Bowning and Woolgarloo	1,561	3,000
Hume	Morebringer	1,607	320
Do	Gordon	1,714	2,080
Do	Collendina	1,788	270
Do	Collendina and Corowa	1,854	720
Hawes	Dewilt, Cobb, and Woko	666	22a. 3r. 14p.
Lincoln	Murrungundie, Bald Hill, and Yarranderry	629a, Solitary	18,240
Do	Dubbo	1,671, Terramungamine, No. 1.	20
Do	Do	1,672, Terramungamine A, No. 2.	20
Do	Lincoln	1,688	9,920
Do	Lincoln, Breelong, Breelong South, and Balladoran	1,689	37,630
Leichhardt	Moorambilla and Moolambong	923	6,300
Do	Moolambong, Tooloon, and Nelgowie	1,720, Warrana	880
Mitchell	Cuddell, Gillenbah, Wood, and Corobimilla	1,890, Gillenbah	13,602
Do	Mundowy and Berry Jerry	3,232, Berry Jerry	11,200
Mitchell and Urana	Waugh, Clyde, Wood, and Birrigo	3,053	8,320
Macquarie	Queenslake and Burrawan	33 and 235, Cowarra A	8,700
Do	Kinchella	219 and 220, Fattorini Islands.	41
Do	Arakoon	221, Pelican Islands	80
Do	Macquarie	232, Brush	26
Do	Do	233, Ocean	340
Do	Cairncross	234, Redbank A	610
Northumberland	Corrabaree and Congewai	46, Wooroowolong	16,000
Do	Bellford	50a, Belford	2,832¾
Do	Teralba	60	2,848
Do	Congewai, Stowe, Olney, and Dora	70, Olney	33,146
Do	Mulbring and Teralba	69a, Sugarloaf	6,400
Do	Eglington and Narara	128	1,280
Do	Ourinbah	29, Ourimbah	6,560
Pottinger	Doona	743, Doona	5,120
Do	Curlewis	1,027, Long Point West	2,000
Do	Denison and Denison West	1,271, Denison	25,960
Do	Nea, Clift, and Breeza	1,665, and part of Nea, 523	19,380
Phillip	Price and Botobolar	30, Botobolar	5,120
Richmond	Tatham	45a, Tatham	640
Do	West Coraki and Ellangowan	625, Coraki	5,400
Do	Ellangowan and Dark	974, Nandabah	3,700
Raleigh	Unkya	70, Unkya	3,200
Rous		38. Six islands in Richmond River, and twenty-two islands in Tweed River.	2,360
Do	North Lismore and Dunnoon	249, Terania Creek	24,260
Do	Nullum	250, Tweed River	22,400
Do		251, Macpherson's Range	56,320
Do	North Casino	255	2,560
Do	Terrania	256, Chindera	396
Do	Cudgen	257, Cudgen	616
Do	Newribar	258, Broken Head	1,280
Do	In Tweed River	335, Stott's Island	350
St. Vincent	Currambene and Nowra	33, Currambene A	4,480
Do	Yerriyong and Jerriwangala	44, Turpentine Range	10,880
Do	Farnham and Cudmurrah	45, Red Head	23,800
Do	Tomaga, Mullendaree, and Mogendoura	99, Tomago	6,000
Do	Conjola	115	51
Do	Termeil	129	500
Selwyn and Wynyard	Hindmarsh, Hillas, Bago, Selwyn, Batton, King, Buddong, and Yellowin	1,961, Bago	58,000
Sturt	Bringagee, Wowong, and Benerambah	2,989, Wowong	4,200
Do	Benerambah	2,990	600
Tara	Moorna	383, Moorna	305
Townsend	Mundiwa	1,404, Deniliquin	1,920
Do	Ronald	1,458, Uroley	3,400
Do	Banangalite, Morrago, and Keranakoon	1,792, Morago	4,800
Do	Conargo	1,849	930
Do	Palmer	1,851	1,280
Do	Dunkeld	1,879, Steam Plains, No. 1	1,080
Do	Moultrassie	1,880, Steam Plains, No. 2	3,840
Do	Edgar	1,901	1,941¾
Do	Campbell	1,902	1,239½
Do	Boyeo and Nallam	3,263, Gulpa Island	13,500
Do	Derulaman	3,264, Tuppal	4,200
Do	Towool, Bullatella, Coronalla, Bungooka, Towarra, Narratoola, and Wonnue.	3,265, Millewa	68,580
Townsend and Wakool	Balpool, Yadebal, Werai, Colimo, and Tumudgery	3,262, Edward River	38,500
Urana	Broome	1,648, Broome	320
Do	Yamma	1,456	1,920
Do	Butherwa	1,695, Brookong	4,800
Do	Yanko South	1,778	282¾

SCHEDULE K—*continued.*

County.	Parish.	Number of Reserve.	Area in Acres.
Urana	Yanko South	1,779	551¾
Do	do	1,780	1,256
Do	Morundah	1,799, Colombo's Piney Ridge A.	10,080
Do	Clyde and Morundah	1,833, Morundah	11,630
Do	Yanko	1,835, Kulki	1,075
Do	Widgiewa and Urana	2,049	465¾
Do	Widgiewa	2,103, The Boundary Gums	40
Do	Palmer	2,216	1,500
Do	do	2,217a	1,760
Do	Osborne	2,317a, Osborne	10,216
Do	Clyde and Boree Creek	2,613	7,950
Do	Gunambil	3,052a	1,400
Do	Palmer	3,105	3,340
Wakool	Noorong, Gonn, Moorangatta, Belmore, and Cobwell	1,445a, Wakool	21,982¾
Do	Winter	1,454	1,600
Do	Moorongatta, Toolmah, and Merran	1,786	5,440
Do	Wetuppa and Cunninyeuk	1,787	11,960
Do	Boyd, &c.	1,789, Neimur	29,649
Do	Yarren, Kyalite, Moolpa, Liewa, &c.	1,790, Edward River (extension of.)	10,835
Do	Mallee	1,834	10
Do	Thelaka	2,032, Thelaka	696
Do	Nunnagoyt	2,066, Campbell's Island	6,220
Do	Wettupa	3,103	5,000
Do	Gonn, Nunnagoyt, Barham, Whymoul, Danberry, Cangan, and Tittil.	3,258, Koondrook No. 1	80,000
Do	Gnuie	3,259, Koondrook No. 2	1,820
Do	Mellool	3,260, Koondrook No. 3	2,760
Do	do	3,261, Koondrook No. 4	2,240
Wallace	Wulwye	233, Wulwye	960
Do	The Peak	335	400
Warradgery	Ulonga	1,823, One Tree	½
Westmoreland	Konangaroo and Genolan	22, Council Chambers Flat	15,360
Do	Bindo	83, Bindo	1,520
Do	Vulcan, Mozart, and Balfour	90	7,000
Wynyard	Murraguldrie and Kilgowla	1,705, Murraguldrie	14,000
Do	Gregado and Woomahrigong	1,871	1,280
Do	Gregado	1,872	640
Do	Livingstone	1,873a	1,280
Do	Woomahrigong	1,874a	1,920
Do	Bulalgee and Carabost	1,918, Carabost A	22,400
Do	South Wagga Wagga	3,027	1,000
Wellesley	Burnima	270, Burnima	206
Do	Burrimbucco	282a	4,000
Do	Cathcart	322, Cathcart	120
Do	Thoko and Wellsmore	343, Ando Hill	640
Do	Ironmungy	356, Ironmungy	2,000
Do	Ironmungy and Bungarby	366	658
Do	Gecar	411, Gecar	420
Do	Bungarby and Peters	428, Snowy River	4,500
Do	Meringo and Merriangaah	874, Bald Hill	2,350

SCHEDULE L.

LANDS exempted from the operation of ordinary timber licenses.

In addition to the lands specified in the 34th Timber Regulation of 24th September, 1878, the following lands have been notified in the Government Gazette as being exempted from the operation of ordinary licenses to cut timber :—

County.	Parish.	Area in acres.	Date of Gazette Notice.	Particulars of Land.
Cumberland	Southerland	.....	24th Dec., 1877	All Crown Reserves.
Do	Londonderry	.....	29th Oct., 1877	All Crown Lands.
Do	Hunter's Hill and Field of Mars	6,235	4th Nov., 1879	Field of Mars Common.
Do	Hunter's Hill	170	22nd Dec., 1879	Lunatic Asylum Reserve.
Gloucester	Verulam and Fitzroy	.....	23rd Nov., 1877	Church and School Lands.
Do	Tuncurry	.....	21st June, 1878	Includes part of Forster's Forest.
Do	Wang Wauh, Kyle, Gooloongolok, Curreeki, Teleraree, Bachelor, Wallingat, Forster, Topi Topi, Booloombayt, and Bullah Delah.	217,600	29th Sept., 1877	Myall and Wallis Lake Forests.
Leichhardt	Euroka and Youendah	4,700	8th Dec., 1884.	
Northumberland	Teralba	2,848	28th Dec., 1884	Reserve No. 60, for coal-mining purposes.
Wynyard	Wagga Wagga	1,000	19th Aug., 1884	Travelling stock reserve No. 3,027
Young	.....	1,600	20th June, 1879	Part of Wilcannia population reserve.
.....	.....	.....	6th Dec., 1878	All Crown Lands reserved as sites for future towns or villages.
.....	.....	4,000	14th Oct., 1878	Lord Howe Island.

SCHEDULE M.

RINGBARKING Applications—Five years' Pastoral Lease.

Applications received.			Applications refused.		Not proceeded with.		Applications in course of action.	Authorities granted.		
When received.	No.	Area.	No.	Area.	No.	Area.		No.	Area applied for.	Area granted.
		Acres.		Acres.		Acres.			Acres.	Acres.
Applications received during the year	133	758,687	32	95,130	10	49,840	20	155	1,618,861	1,207,537
Applications in course of action, 31st December, 1883	84	1,138,334								

APPENDIX.

Annual Progress Report for the year 1884.

Report of the Inspector of Forests to The Under Secretary for Mines.

Sir, Sydney, 20 July, 1885.

I have the honor herewith to submit my Annual Progress Report upon the Forest Conservancy Branch of this Department for the year 1884. I have, &c.,

JOHN DUFF.

Reserves inspected, Reports submitted, and work performed during the year 1884.

January, 1884. Inspected the wattle plantations on Southern Railway Line, between Campbelltown and Cootamundra, and engaged four men to clear off grass and weeds from around the wattle plants to prevent them being smothered by grass and weeds, or burned through sparks from the engines igniting the grass when dry.

The clearing was done between the plants with hoes, and a strip of land on each side of the rows of wattles was cleared of grass with scarifiers drawn by horses.

The best wattle plantations are those between Minto and Campbelltown, and Hill Top and Colo Vale, most of the other plantations being a comparative failure owing chiefly to dry seasons and the poor shallow soil in which they were planted.

Clearing the wattle plantations commenced on 22nd January, and was completed on 19th April following, the work being done by four men and two horses.

About 20 miles in length of the plantations, containing about 6,690 trees, and extending from Minto to Yass, were cleared, and only those plantations in which the trees were sufficiently numerous to justify incurring the expense of clearing were operated upon.

The clearing was conducted under the supervision of Mr. Forest Ranger Rotton, and cost the Department about £180 for labour.

It is much more difficult and expensive to plant and clean the long narrow strips of ground planted with wattles on the railway line than it would be if a block of (say) several hundred acres of land were prepared and planted, and the liability to losses through sparks from the engines igniting the grass when dry is much greater on the railway line than it would be on a large plantation situated at some distance from the railway line.

January. Inspected the Catalpa plantation at the Cootamundra Railway Station, and found that the trees were making vigorous growth, having grown from 3 to 5 feet since planted about five months previously, proving that the soil and climate of Cootamundra are well adapted for the growth of the Catalpa speciosa, and as the trees required supports, a man was sent from Sydney to stake and tie them, at a cost to the Department of about £5.

February. Inspected the land on the north shore side of the Hunter River at Newcastle, reported by Mr. Harbour-Master Allen to be liable to collapse and silt up the river owing to the timber on it being cut and removed for firewood, and therefore increasing the sand-drift. Recommended that the land should be reserved from the operation of all descriptions of leases or licenses, and placed under the supervision of an official whose duty it would be to occasionally inspect the reserve.

March. A new fence, 9¼ rods long, was erected on the eastern end of the Catalpa plantation, at Cootamundra Railway Station. The wires in the other fences around the plantation were strained; the new fence and repairs being required to prevent goats, &c., from obtaining access to the trees, the work costing the Department the sum of £5 12s. 6d.

March. Inspected town reserves, West Maitland, accompanied by the Mayor of that town (R. Hyndes, Esq.), for the purpose of selecting a site for planting Catalpa speciosa trees. The soil and situation of the reserve were considered suitable for the Catalpa, but the expense requiring to be incurred for trenching and fencing separate borders and patches of ground for the trees, which was the only suitable method that could be adopted for planting the reserve, was considered an obstacle to carrying out the work, and I understand the Borough Council of West Maitland also raised some objections to the conditions upon which the Forest Branch proposed to plant the reserve, if it should be considered suitable for the Catalpa trees.

Advised the Mayor with reference to the best mode of laying out and planting the West Maitland reserves, and furnished that gentleman with a list of the trees and shrubs best adapted for the soil and climate of the district.

March. Accompanied the Honorable the Postmaster-General and the Superintendent of Telegraphs to near Belmont, Newcastle District, for the purpose of inspecting and reporting upon the land cleared of timber for telegraph line, and estimating the extent of clearing and value of timber cut and removed therefrom.

Inspected Mr. Forest Ranger Coberoft's district, Gosford, and held an inquiry respecting his performance of the duties of his office, and at the same time inquired into the performance of the duties of his assistant, Mr. Assistant Forest Ranger Brunker, and submitted reports thereon.

April. At the request of Baron Mueller, Government Botanist, Melbourne, and with the approval of the Honorable the Minister for Mines, detailed instructions were issued to all the Forest Rangers to collect and dry specimens in bud, expanded flowers, and ripe fruit of all species of eucalyptus in each of the Forest Ranger's districts, and to furnish the local names, habitats, extent of distribution, and full information respecting the uses and general characteristics of each species, the specimens and information being required by Baron Mueller to assist him in correctly identifying, describing, and illustrating the numerous species of New South Wales eucalypts in his "Eucalyptographia," or Atlas of the Eucalypts of Australia.

The Forest Rangers were supplied with drying paper, boards, and straps, to enable them to preserve the eucalypt specimens.

Inspected

Inspected the Macpherson Range and other forest reserves in Messrs. Green and Shadforth's districts, Richmond River, and held an inquiry into Mr. Forest Ranger Green's management of his district, and submitted a report thereon. May

The attention of the Honorable the Minister for Mines having been directed by Mr. Godhard to the value of the rain tree (*Pithecolobium Saman*) especially for its sweetish seed-pods, which constitute a very fattening fodder for stock, for which purpose it is now extensively cultivated in several countries, the Minister for Mines requested me to furnish him with a full report upon the nature and uses of the tree, on receipt of which he instructed me to take steps to procure seeds of it, and endeavour to get it established in as many parts of the Colony as are suited for its growth. A letter was therefore forwarded to the Director of the Royal Botanic Gardens, Calcutta, requesting him to supply this Department with seeds of the tree, and that gentleman promptly forwarded 5 lb. of its seed, 2 lb. of which was sent to the Director of the Sydney Botanic Gardens, for the purpose of raising plants of it in the State Nursery; and 3 lb were distributed amongst seven Forest Rangers, chiefly in the northern coast districts, who were instructed to sow them in suitable places in the forest reserves and in private gardens in their districts, and to report *re* progress of the tree. June.

Messrs. Forest Rangers Green, Richmond River, and King, of Coonamble, report that they have only succeeded in raising two plants and one plant each from the seed forwarded to them, and that the plants are making satisfactory progress, having grown about 18 inches since planted; and the Director of the Botanic Gardens reports that 130 plants have grown from the seed sown in the State Nursery, and if the plants survive the winter, which is very doubtful, it is proposed to form one or more plantations of them in the warmer parts of the Colony during the ensuing spring. The small number of plants raised from the seed sown is chiefly attributed to last summer being very hot and dry.

The advisability of planting out young cedar trees in the forest reserves in the cedar-growing districts was first brought under the notice of the Honorable the Minister for Mines in April, 1883, and a report was then submitted containing recommendations for proceeding with the work. The proposal to plant cedar in the forest reserves was approved by the Minister, and arrangements were made to commence planting on the Dorrigo Forest Reserve, Bellinger River district, and a sum of £300 was authorized to be expended on the work. July.

An overseer and six men were engaged, on the 4th August, to commence cedar-planting on the Dorrigo Forest Reserve, Bellinger River District, the number of trees planted during the month being 849; and 300 root-cuttings were also planted during the month as an experiment, the cuttings having since been reported as a complete failure. August.

The wages of overseer and men for the month, cost of tools, and carriage of tools and rations to the plantation, amounted to £92 2s. 7d.

During the month a border on each side of the Bank-street Reserve, East Maitland, was levelled, and trenching commenced for a plantation of black walnuts (*juglans nigra*) and Catalpa speciosa; 221 plants of each tree, or a total of 442 plants, were planted, and parallel inner fences were erected to enclose the trees, and prevent them being injured by cattle, boys, &c. August.

The cost of trenching and fencing the plantation, exclusive of supervision, amounted to about £197, and a sum of about £8 or £10 was expended for staking, tying, and watering the trees, and for a few necessary tools, the whole of the work connected with the plantation being completed in October.

Cedar-planting was continued on the Dorrigo Forest Reserve up to the end of this month, during which period 2,083 trees were planted, at a cost to the Department of £74 17s. 8d. for wages. Heavy soaking rains having fallen towards the end of the month and in the beginning of October rendered the watering of the trees unnecessary, and greatly assisted their growth. September.

The cedar plantations have been inspected on several occasions by Mr. Forest Ranger Mecham, who reports that the trees have grown well, and only a very small percentage of those planted have failed.

The plantation of Catalpa speciosa at the Cootamundra Railway Station was extended by trenching 104 rods of ground, and planting 121 plants of Catalpa, and 121 plants of juglans nigra, the black walnut thereon, and with the fifty Catalpa trees planted in 1883, there is now a total number of 272 trees in this plantation. The trenching and planting were completed on the 16th October, and cost the Department a sum of about £85, and the plantation has since been frequently inspected by Mr. Forest Ranger Stevenson and Mr. Assistant Forest Ranger Postlethwaite, who report that the trees have made healthy and vigorous growth. September.

Twenty-five red cedar trees were planted as an experiment on the Olney Forest Reserve, in County of Northumberland, by Mr. Forest Ranger Coberoft, who reports favourably of their progress. This would be a very suitable district in which to plant cedar, as its close proximity to Sydney would enhance the value of the timber. September.

Mr. M'Dougall, the overseer of the cedar plantation on the Dorrigo Forest Reserve, was engaged from the beginning of September till the 18th November in removing undergrowth from around the young cedar trees on the Dorrigo Forest Reserve, his wages for this period amounting to £22. September.

Inspected wattle plantations between Junee and Coolamon on south-western railway line; Catalpa plantation, Cootamundra; and wattle plantation between Minto and Colo Vale; and recommended that the latter plantation should be cleared of grass and weeds to prevent the plants from being destroyed by sparks from the engines igniting the grass, and also that where the plants were growing too closely together the weakest plants should be cut out. These recommendations were approved, and accordingly a man was engaged on 12th November to carry out the work. Another man was employed at end of December, at which time the clearing was completed to near Hill Top, and up to end of December the cost for clearing amounted to £17 6s. Clearing has still to be done between Minto and Menangle. September.

Inspected the Brewarrina District for the purpose of ascertaining and reporting respecting the quality and uses of the indigenous timbers, and if it would or would not be advisable to appoint a Forest Ranger to the district. Owing to the inferior quality of the timber of the district, I did not strongly recommend the appointment of a Forest Ranger, and whilst admitting that such an appointment would tend to check wasteful destruction of timber and increase the revenue from license fees, &c., I, at the same time, submitted for consideration whether it would not be preferable to appoint additional officers to some of the more important timber districts, many of which are too large to be properly supervised by the existing staff. October.

Inspected Catalpa and Walnut Plantation in Bank-street Reserve, East Maitland, and requested the Mayor to authorise a man to be sent to remove weeds therefrom. November.

As

As the Catalpa trees had made rapid growth and required tying, and the ground being very dry it was necessary to water the trees, the amount required for the purpose was obtained, and a man sent to attend to the trees.

December. Accompanied by Mr. F. J. Ferguson and Mr. Forest Ranger Coberoft, I inspected all the Forest and Water Reserves situated between Gosford and East Maitland for the purpose of selecting a site for a Forest Nursery, and after a careful inspection of these reserves it was decided that the best position for the Nursery would be on Hogan's Brush Forest Reserve No. 63, it being within 2½ miles of Gosford, and about 1½ miles from Fountain's Platform, on the Homebush-Waratah railway line. There is a permanent supply of excellent water on this reserve, and the quality of the soil is all that could be desired.

Unless the land should be purchased for the Nursery, no more convenient site for the receipt and dispatch of plants by rail or steamer could be chosen. Tenders have been invited and received for clearing and fencing the 20 acres of land for the Nursery, but previous to commencing the work the land has to be surveyed.

Office Work.

In addition to the work specified as being performed throughout the year, numerous reports and letters have been written, and many of the Forest Rangers' and other reports have been submitted to me for perusal and advice on the various subjects on which they treated. Considerable time has been occupied in the examination, arrangement, and preparation of collections of eucalypt and other specimens and seeds received from the Forest Rangers throughout the Colony, duplicates of which specimens have been forwarded to Baron Mueller when received, to enable him to classify and describe the eucalypts of this Colony in his "Eucalyptographia"; and some of the specimens forwarded to the Baron have proved that certain species are indigenous to localities not hitherto known; whilst others, it is thought by the Baron, will prove to be new undescribed species, which, in many instances, cannot be described until sufficient materials to enable them to be accurately determined can be obtained. The value of the learned Baron's labours in making known to the world the existence and uses of the timber trees of the Colonies, and of the assistance rendered to him by the Forest Branch, cannot be over-estimated, and I trust the Forest Branch will always be permitted to assist him in his labours in every possible way, as the information thus disseminated by the Baron is of universal value and importance.

Forest Nurseries.

The land intended for the Forest Nursery, near Gosford, will be cleared of timber, fenced, and laid out, and the necessary buildings erected, on completion of the survey of the portion intended for Nursery purposes; and the propagation of indigenous and foreign timber trees for planting in Forest and other Reserves and distribution will then be proceeded with.

A site will also be selected for a Nursery in the interior, for the purpose of testing the kinds of trees that are suitable for planting in the dry districts.

Ringbarking.

The Honorable the Minister for Mines having approved of my recommendation to leave belts of trees for shade and shelter around blocks of 5 miles square, permissions to ringbark are now granted in accordance with this decision, or a modification of it, if good reasons can be given by the lessees and Forest Rangers reporting upon applications for permission to ringbark for a departure therefrom.

Thinning and Scrubbing on Forest and other Reserves.

Thinning and scrubbing on the following Forest and other Reserves have been proceeded with during the year at the entire expense of the applicants or lessees of the runs on which the Reserves are situated.

On Nowraine Run (Messrs. Lyell and Simpson, lessees), county of Urana, forest reserves Nos. 2,216, 2,217, and 2,996, including water reserves Nos. 1,118, 1,143, and reserve No. 2,038, were thinned and cleared of scrub, the pine saplings being left at distances of 12 feet apart on the forest reserves, and 15 feet apart on the water reserves, an area of about 9,860 acres on the whole of the reserves having been cleared at a cost of about 5s. 6d. per acre to the lessees, the work being supervised by Mr. Forest Ranger Condell, assisted by Mr. J. J. Allen.

On the Milbrulong forest reserve, No. 2,722, on Mittagong Run, county of Mitchell (Mr. J. F. M'Mullen, lessee), an area of 3,569 acres was thinned and cleared of scrub, under the supervision of Mr. Forest Ranger Taylor, assisted by Mr. J. B. Reid.

On Urana Run, county of Urana (Messrs. Watt and Thomson, lessees), water reserve No. 2,081, forest reserve No. 2,049, and a portion of adjoining Crown Lands were thinned and cleared of scrub under the supervision of Mr. Assistant Forest Ranger Musgrave, and at a cost to the lessee of about 10s. per acre.

On Yanco Block A Run, Murrumbidgee District (Mr. L. Kiddle, lessee), about 390 acres have been cleared of scrub on forest reserves Nos. 1,879 and 1,880, under the supervision of Mr. Forest Ranger Wilshire.

New Timber Regulations.

During the year new timber regulations have been framed, the principal objects in so doing being to prevent monopoly and wasteful destruction of timber, and to increase the revenue derivable from the timber of the Colony; and considering that the revenue obtained from the timber of New South Wales during the year 1883, including proceeds of sales of seized timber, ringbarking inspection fees, and quarry licenses, only amounted to £16,685 19s. 7d.; that after paying working expenses of the Forest Branch, a balance of only about £1,287 was placed to general revenue; that hitherto comparatively little has been done by the Department towards planting treeless districts in localities where timber is becoming scarce, or in thinning and pruning naturally produced trees in the forest reserves, the expenses of which work should be defrayed by revenue obtained from the timber;—I think it cannot be denied that the increased rates are necessary and reasonable. In framing the new regulations those of the other Colonies were very carefully considered, and care was taken that they should not be more restrictive, or the charges for license fees, royalty, &c., higher than those imposed in the other Colonies; in fact, in several instances the charges proposed in the new

new regulations are lower than those of some of the other Colonies; for example, in Queensland the royalty charged on cedar is 3s. per hundred superficial feet, whilst in this Colony the highest charge for royalty is 1s. 6d. per hundred superficial feet. Considerable dissatisfaction has been expressed by timber merchants and licensees in this Colony respecting what they represent as the excessive charges on timber proposed in the new regulations, and it has been urged by them that these increased rates and restrictions will compel them to import timber from other countries and Colonies; but these assertions are misleading, as under the new regulations timber can be procured at as cheap or cheaper rates than it could be obtained elsewhere; and it is well known, although a few kinds of timbers are imported from New Zealand, America, &c., such as Kaurie pine, Baltic deal, Californian redwood, &c., for which we have no suitable substitutes, that the hardwoods, cedar, and some of the other timbers in this Colony cannot be surpassed for cheapness, or the purposes for which they are used, by any kinds of timbers imported from other countries or colonies.

I am fully convinced that this Department hitherto has not obtained more than half the revenue from the timber that it should have yielded, considering that the timber trade is one of the most important of our Colonial industries; and the increased charges now proposed are absolutely necessary to enable the work of forest conservation to be carried on so as to attend to and preserve existing forests as far as practicable, plant trees where necessary, and prepare for the timber requirements of future generations; moreover, I cannot see that the proposed increased rates on the timber will be detrimental to the interests of the timber merchants or licensee, as the latter will merely charge the former a higher price for cutting and hauling the timber, and the timber merchants will correspondingly increase their charges to the public.

Forest Flora.

The Honorable the Minister for Mines having approved of the publication of an illustrated work on the Forest Flora of this Colony, several Forest Rangers have been instructed to collect and forward specimens of leaves, flowers, fruit, wood, and bark of the most useful kinds of timber trees in their districts for illustrating and describing in the flora, and also to furnish full information respecting the extent of distribution, uses, dimensions, habitats, and general characteristics of the various kinds of timber trees, of which specimens are forwarded, so as to enable the fullest information concerning them to be furnished in the work. The difficulty of procuring specimens from long distances sufficiently fresh to enable drawings of them to be made has been great, and has considerably retarded the progress of the work, most of them, although carefully collected and packed, being found on receipt to be useless for the purpose, consequently only four drawings of trees have yet been made. Delay has also been caused through Mr. Nilson, the draughtsman, being unable to work at the drawings, except by daylight, and this, during the winter months, his official duties prevented him from doing. It is proposed to publish the work in parts, each containing six plates and descriptions of trees, and as information has been collected respecting the trees of which drawings are finished, it is expected that the first part will be published in the course of two or three months.

The Timber Trees of New South Wales.

The publication of a pamphlet on the timber trees of New South Wales was approved by the Minister, the work having been compiled by Mr. Arvid Nilson, of the Survey Office, from the works of the most reliable authorities on the subject, was printed and distributed amongst the Forest Rangers, Schools of Arts, and other educational institutions throughout the Colony.

It is intended hereafter to correct and augment the information contained in this work, when the fullest information has been collected respecting the timber trees of the Colony.

Collecting and drying specimens of indigenous trees, seeds, &c.

Collections of tree seeds and eucalyptus specimens chiefly have been made by several of the Forest Rangers, with the view of assisting Baron Mueller in figuring and describing the Eucalypts of the Colony in his "Eucalyptographia"; also for exchanging with kindred Departments, and procuring a collection of named specimens for reference in this Department, Baron Mueller having kindly undertaken to furnish the names of all specimens forwarded to him. The Forest Rangers also retain a duplicate set of the specimens they collect for their own use, and are afterwards furnished with their correct names.

List of rare indigenous and foreign trees desirable to plant in forest or other reserves.

A list is hereto appended of rare indigenous and foreign trees which it would be desirable to plant in suitable localities throughout the Colony.

List of indigenous timber specimens named and arranged on the ground floor of this Department.

A list of the orders and botanical and local names of the timber specimens exhibited in this Department is hereto appended.

Donations received.

From J. E. Brown, Esq., F.L.S., Conservator of Forests, Adelaide, twenty-two copies of his "Treatise on Tree Culture in South Australia." — March, 1884.

From Mr. Bailey, Brisbane, per Secretary for Mines, 1¾ lb. rain-tree seeds (*Pithecolobium saman*). — July, 1884.

From Charles Moore, Esq., F.L.S., Director, Botanic Gardens, Sydney, 320 plants of black walnut (*juglans nigra*), 280 plants of *Catalpa speciosa*, and twelve plants of *Pinus insignis*. — September, 1884.

From J. E. Brown, Esq., F.L.S., Conservator of Forests, Adelaide, 100 plants of *Catalpa speciosa*. — October, 1884.

From C. J. Horsley, Esq., Crown Lands Agent, Brewarrina, seeds of "gruie or colaine" (*Owenia acidula*.) — December, 1884.

From Baron Mueller, F.R.S., K.C.M.G., Government Botanist, Melbourne, botanical names of collections of Eucalypts, of the poison plants, and various other specimens of trees indigenous to New South Wales. — December, 1884.

Seeds, &c., presented by Forest Branch, Department of Mines, Sydney.

Sent to C. Moore, Esq., F.L.S., Director, Botanic Gardens, Sydney, 2 lb. rain-tree seeds (*Pithecolobium saman*). — October, 1884.

Sent to Baron Mueller, Government Botanist, Melbourne, seeds of *Owenia acidula* and *Endiandra sp?* (corkwood), from Port Macquarie. — October, 1884.

Sent to W. R. Guilfoyle, Esq., F.L.S., Director, Botanic Gardens, Melbourne, seeds of *Owenia acidula*. — October, 1884.

November, 1884. Sent to G. B. Scott, Esq., Wagga Wagga, seeds of rain-tree (*Pithecolobium saman*).

November, 1884. Sent to C. Moore, Esq., F.L.S., Director, Botanic Gardens, Sydney, seeds of *Owenia acidula*, *Endiandra sp?* (corkwood), Port Macquarie, and *Eremophila longifolia* (emu bush).

December, 1884. Sent to Baron Mueller, F.R.S., K.C.M.G., Government Botanist, Melbourne, seeds of *Owenia acidula*.

List of useful and rare Timber Trees suitable for planting in Reserves.

Sequoia semper virens—Californian redwood.
Dammara robusta—N.S.W. Kauri pine.
Araucaria Cunninghamii—Moreton Bay pine.
Quercus cerris—Turkey oak.
,, *pedunculata*—English oak.
,, *Ilex*—Evergreen oak.
,, *suber*—Cork oak.
,, *tinctoria*—Dyer's oak.
,, *virens*—Live oak.
Juglans Regia—Common walnut.
,, *nigra*—Black walnut.
Ulmus montana—English elm.
Grevillea robusta—Silky oak.
Laurus camphora—Camphor tree.
Fraxinus Americana—American ash.
,, *excelsior*—English ash.
Eugenia myrtifolia—Brush cherry.
,, *Ventenattii*—Water gum.
Eucalyptus calophylla—Red gum, W. Australia.
,, *cornuta*—Yeit., W. Australia.
,, *globulus*—Blue gum.
,, *maculata*—Spotted gum.
Eucalyptus marginata—Jarrah, W. Australia.
,, *siderophloia*—Ironbark.
,, *corynocalyx*—Sugar gum.
,, *rostrata*—Red gum.
,, *diversicolor*—Karri gum.
,, *microcorys*—Tallow-wood.
,, *pilularis*—Blackbutt.
,, *longifolia*—Woollybutt.
Acacia melanoxylon—Blackwood.
,, *pendula*—Myall.
Harpullia pendula—Tulipwood.
Flindersia australis—Native ash.
Gmelina Leichhardtii—White beech.
Stenocarpus salignus—Beefwood.
Dysoxylon Fraserianum—Rosewood.
Fagus Moorei—True native beech.
Podocarpus spinulosus—White pine or deal.
Tristania conferta—Brush, bastard, or white box.
Robinia Pseudo-Acacia—False acacia.
Rhus rhodanthema—Yellow cedar.
Cedrela australis—Red cedar.

List of Timber specimens arranged on ground-floor of the Mining Department, Sydney.

Acacia melanoxylon. Blackwood.
,, sp.? Hickory.
,, sp.? Golden green wattle.
,, sp.? Silver-leaved boree.
,, sp.? Yarren or myall.
,, doratoxylon. Currawang.
,, sp.? Umbrella bush.
,, salicina. Cuba or native willow.
,, hakeoides. Black wattle.
,, sp.? Yarren.
,, sp.? ,,
,, sp.? Black myall.
,, sp.? Myall.
Avicennia officinalis. Mangrove.
Angophora intermedia. Apple-tree.
Banksia integrifolia. Honeysuckle.
Backhousia myrtifolia. Scrub myrtle.
Ceratopetalum apetalum. Coachwood.
Cargillia pentamera. Black myrtle.
Casuarina quadrivalvis. Swamp oak.
,, torulosa. Forest oak.
,, equisetifolia. Bull oak.
,, suberosa, fœm. She oak.
,, ,, mas. He oak.
Cedrela australis. Red cedar.
Doryphora sassafras. Sassafras tree.
Eucalyptus rostrata. Red gum.
,, maculata. Spotted gum.
,, resinifera. Mahogany.
,, leucoxylon. Red ironbark.
,, crebra. Grey ironbark.
,, piperita. Redwood or peppermint.
,, virgata. Mountain ash.
,, corymbosa. Bloodwood
,, longifolia. Woollybutt.
,, obliqua. Messmate.
,, sp.? Mountain gum.
,, sp.? Stringybark.
Eucalyptus sp.? Stringybark.
,, pilularis. Blackbutt.
,, sp.? White box.
,, sp.? Round-leaved box.
,, melliodora. Yellow box.
,, albens. White box.
,, sp.? Red box.
,, sp.? Black ironbark.
,, robusta. Swamp mahogany.
,, microcorys. Tallow-wood.
,, saligna. Grey gum.
Eugenia ventenatii. Large-leaved water gum.
,, myrtifolia. Brush cherry.
Exocarpus, cupressiformis. Native cherry.
Frenela endlicherii. Red or black pine.
,, robusta. Common, white, or scrub pine.
Flindersia oxleyana. Yellow-wood.
Geijera parviflora. Dogwood.
Gmelina Leichhardtii. White beech.
Melaleuca leucodendron. White or broad-leaved tea-tree.
,, styphelioides. Prickly-leaved tea-tree.
Myrtus acmenoides. Lignum vitæ.
Melia australis. White cedar.
Orites excelsa. Red ash.
Rhus rhodanthema. Yellow cedar.
Stenocarpus salignus. Beefwood.
Syncarpia laurifolia. Turpentine tree.
Sloanea australis. Maiden's blush.
Sterculia diversifolia. Kurrajong tree.
Tristanea suaveolens. Beech or swamp mahogany.
,, neriifolia. Small-leaved water gum.
,, conferta. Brush, bastard, or white box.
,, laurina. Broad, long-leaved water gum.
Tarrietia actinodendron. Black stavewood.
Wilga.

Total, 71 species, or 87 timber specimens, including duplicates.

Timbers from Lord Howe Island.

1	Hot bark.	
2	Blue plum—*Achras australis*	7½ × 6 in.
3	Honeysuckle	6½ × 5 in.
4	Curley palm.	
5	Scaley bark	14½ × 11 in.
6	Honeysuckle (2)	12½ × 11½ in.
7	Blackbutt	17 in.
8	Grey bark	17 × 15 in.
9	Ivorywood	9 in.
10	Tamana	15 in.
11	Yellow-wood	14½ in.
12	Howe Island pine	9 in.
13	Sallywood or white oak	11 × 10 in.
14	Bloodwood	13 × 11 in.
15	Honeysuckle	12½ × 11½ in.
16	Maulwood	11 in.
17	Honeysuckle	15 × 14½ in.
18	Lignum vitæ	8½ × 7½ in.
19	Red berry (2)	8½ in.
20	Yellow-wood	12 × 11 in.
21	Cottonwood	13 in.
22	Thatch palm—*Kentia Forsteriana*	6½ × 6 in.
23	Juniper.	
24	Forkey tree—*Pandamus Forsteriana*.	
25	Small mountain palm—*Kentia Moorei*.	
26	Large mountain palm—*Kentia Canterburyana*.	
27	*Dracophyllum Fitzgeraldi*.	
28	*Pittosporum erialoma*.	
29	Carrons tree.	
30	Black plum—*Achras australis*.	
31	Banyan—*Ficus columnaris*.	
32	Blue plum.	
	2 unmarked.	

Dr. R. Lendenfield to the Minister for Mines.

Glenburn, Sydney, 28th February, 1885.

I beg to submit the following report, the result of my recent investigations into the life history of an insect destroying the pine scrub in the Nymagee, Condobolin, and Forbes District.

The report is divided into the following fourteen parts, and two plates are appended :—

1. Introduction.
2. The utility of timbered and scrubby country.
3. Pine scrub.
4. An important parasite on pine.
5. The Beetle.
6. The lava. The anatomy of its jaws.
7. Occurrence.
8. The life history of the insect.
9. The structure of the pine-stem.
10. The physiological effect of ringbarking.
11. Influence of the insect on the pine.
12. The effects observed.
13. Practical results and suggestions.
14. Explanation of plates.

1. *Introduction.*

Before entering on my subject it is my pleasant duty to express my thanks to those who have materially assisted me in carrying out the work entrusted to me by the Hon. the Minister for Mines. The Hon. William Macleay furnished me with the most important information on the subject. Mr. Thomas Glynn, of Nymagee, the Brothers Pearson, of Nangerybone, and Mr. Dadney, of the Steam Scoop Works, assisted me by their hospitality and in other ways, and I am also indebted to Mr. Kidston, the Local Inspector of the District, for much valuable information.

2. *The utility of timbered and scrubby country.*

It is known since the times of Archimedes that only one thing can be in one place at the same time. Slightly modified, this law applies to the vegetation. There is a certain allowance of water and light, and this can be used once only. It is well known to everyone who has been in the country that either scrub and timber or grass can grow, but not both simultaneously at the same place. The rainfall, particularly in the interior, is not enough for both. Most of the timber and all the scrub is valueless, and it would accordingly appear of great advantage to the lessees of Government land if there was only a little of the necessary useful timber in the land, no scrub, and if the country were covered with grass. It has been asserted that the clearing of the country would influence the climate, and also in other ways would cause changes of a kind to make the whole of the country absolutely useless to posterity. I contend that this is a simple prejudice. In the European Alps, where it is absolutely necessary to conserve the timber, the circumstances are totally different. There the trees are required for the purpose of holding the soil to the steep mountain sides, and in this way prevent avalanches and floods. In Australia there are no slopes sufficiently steep to allow of a comparison with the European Alps.

The effect which is produced on a steep slope in a very rainy country cannot be produced in an undulating land with very little rainfall by the same cause—timber. If the water that falls in the shape of rain does not enter the soil to a large extent, much more of it will be lost by flowing into the sea than there would if more of it were sucked up by the soil, and could be turned into practical use by furnishing the grass with the necessary moisture. This water would evaporate during dry seasons, causing a dew thereby. Further also, the disastrous floods, caused by volumes of water flowing off the soil without being engulfed or retarded, in a heavy downpour, would lose their extent and danger if the soil could be made to absorb more water.

The amount of water absorbed is of course in proportion to the sponginess and looseness of the soil on one hand, and the time during which the water remains on the soil on the other.

In a timbered or scrubby district in the interior the soil is smooth and hard, the water falling on it flows down the flanks of the low hills at a terrific rate; not impeded by anything when the rivulets are small and weak, they rapidly join to form a torrent irresistible and dangerous which will often do more harm than good.

Were grass to grow there instead of timber, then the soil would be loosened. Every little root of a plant of grass will, when dead and decayed, leave a little open channel. Many of these channels will soon be formed when grass once grows, and they will lend to the soil that peculiar spongy structure which is so essential a qualification of good soil. Given the same rainfall as described in its effects on timbered country above, much more water will be absorbed by the paddock than would have been by the forest. But the grass has a still more important influence on the flow of water. Every blade of grass will retard its progress, and so the soil will have more time to absorb the water. More water will be retained, floods will be prevented, and the whole must evidently have a most beneficial influence on the country and on the climate.

It is evident, therefore, that clearing the country of useless scrub and timber would be most advantageous; it would not only be of immediate advantage to the country, but also of lasting advantage to posterity; by keeping more water in the country the dew and rainfall must necessarily be increased.

It would lead too far to follow this out any further here.

3. *The Pine Scrub.*

In certain districts in the interior a large portion of the scrub, the noxious influence of which on this Colony has been proved in the previous chapter, consists of conifers belonging to the genus *Callatris*, the well-known pine. The pine is, when it grows well, most valuable timber, but it is only a very small percentage of pine plants which actually are valuable trees. The pine tree takes apparently forty years to grow to sufficient size. Pine trees of that age are about 10 inches thick 15 feet from the ground. They do not grow to very large dimensions in the districts visited by me. The largest on record (Thomas Glynn, Esq.) measured 3 feet across at the base. These trees lend to the vegetation a peculiar character, and the

difference

difference between forests with many pine trees, and such without, is very striking; the pine trees grow in clusters. There seems not to be any extent of forest consisting of pine only; various eucalypty, the box, and the ironbark, are always mixed up with them. If among the tall trees the pine is comparatively rare, it is most abundant in the shape of scrub wherever it can grow. In some places this scrub is so dense that it can be pronounced impassable, and in one instance (Mr. Kidston) no less than fifty-nine little pine plants have been counted on 1 square foot, that is, a plant per every 2·4 square inches. As stock does not eat the pine, and as these dense scrubs preclude the growth of any edible scrub or grass on the locality, it is evident that it appears of the greatest importance to get rid of the superabundance of it. A sufficient number of trees for building purposes can easily be reserved. In the above chapter it has been shown that the clearing of the scrub has no injurious influence on the climate, so that every possible mode of destroying this scrub should be employed.

4. *An important parasite on the pine.*

The Honorable Mr. Copeland, travelling in the district, noticed that great patches of pine scrub were dying, and he investigated the cause thereof, together with Mr. Glynn. They found that a grub was eating the timber, and ascribed the dying of the scrub to this grub. Mr. Copeland drew attention to this important fact, and specimens were procured through the Government geologist. The larva of a beetle and also the beetle itself were found in the passages gnawed by the insect in the timber, and the beetle was identified. My recent researches have shown that it is indeed this beetle which causes the pine scrub to die.

5. *The Beetle.*

The beetle which in its young larva stage causes the destruction of the pine is represented in Plate I, figs. 1 and 2. That this is really the beetle in question has been proved by finding many specimens *in* the pine stems. The beetle is *Diodoxus erythrurus* (white).

Diodoxus is a genus confined to Australia, and represented by two species—*Diodoxus erythrurus* and *scalaris*.

The genus *Diodoxus* belongs to the family *Buprestidae*, most of the members of which are characterised by their very peculiar shape.

They are greatly compressed, only ¼–½ as high as broad, and of an oval shape. The head, thorax, and abdomen are not divided by deep and marked incisions from each other.

Both flaps of the lower jaw are characterised by their soft membranaceous appearance. They possess no defensive or offensive thorns, but are covered with soft hair. The feelers have eleven joints. The dixatal ones are of such a shape as to give to the whole centrifugal part of the feeler a serrated appearance. The legs are short. Abdomen and legs have five joints. The prothorax possesses a posterior process, extending in some cases as far back as the metathorax.

The species *Diodoxus erythrurus*, our beetle, is characterised as follows:—The male is 0·65 inches long, 0·2 inches broad, and about 0·08 inches high. The female appears to be much larger—1·1 inches long, 0·3 inches broad, and 0·1 inches high. With the exception of the size the two sexes are perfectly alike. Shape and colour correspond.

At the sides of the head the eyes are situated; the visible part of the head between the eyes, as seen from above, appears broader than long. There is hardly any incision between head and thorax (breast). The thorax seen from above appears quadratic. The abdomen has the shape of a gothic arch. The whole beetle is oval, truncate anteriorly, and more pointed posteriorly.

The dorsal exoskeleton of the head and thorax is dotted, granular, the wing-covers striped longitudinally, in consequence of the existence of raised granular lines divided from each other by slight grooves. The raised parts are much broader than the dividing grooves: eleven on each side. With a magnifying glass the grooves can be seen to be formed by longitudinal lines of small depressions or holes, which are similar to the irregularly disposed ones on the head and thorax. The feelers are short, about as long as the thorax, and slender. No spines are found on the legs except at the lower joints.

The ventral plates in front are large. The latter part of the abdomen is covered by two narrow rings, and an end piece.

The colour of our beetle is green, black, and orange.

The dorsal side is black, with large orange-coloured spots and stripes. These are of characteristic shape. The eyes appear dark green; the forehead orange, with a small black line extending for a short distance in the centre forward. The dorsal side of the thorax possesses an orange line in the centre extending longitudinally, and an orange line on each side at the margin. The anterior part of this is wider than the posterior, and contains a green patch. Two black bands, widened posteriorly, divide these orange lines from one another. On the wing-covers there are four pair of large orange spots. The anterior pair are elongated longitudinally, and twice as large as the others, which decrease in size posteriorly. The two middle pair are somewhat semi-lunar, the last smallest pair oval.

The anterior two-thirds of the ventral sides are green. The rings are dark reddish brown, with a pair of round orange-coloured spots on each. The legs are likewise green.

6. *The Larva.*

The larvæ and their principal jaw are represented in plate I, Figures 3–8. The time the larvæ take to reach maturity is not known, but extends probably over several years.

The young larva (fig. 5) has, more or less, the shape of a large maggot. As it grows it changes its shape somewhat. It not only increases in size, in length, and breadth, but the head grows to quite a disproportionate size. The larvæ are light, pale, whitish, yellow; only their protruding jaws are dark-brown. The body shows the usual rings, which have the same size in the greater part of the body. The last segments are slightly smaller, narrower than the others. The largest larva I have seen, measured 1·7 inches in length, 0·3 inches in breadth, and 0·15 inches in width. The large flat head, which is nearly circular, measured 0·42 inches across.

The Anatomy of the Principal Jaws.

This larva eats through the timber of the pine, and produces extensive tunnel-shaped excavations (plate II.) This is what makes this insect important to us. The larva is enabled to perform this difficult task of burrowing in the hard pine timber by the peculiar structure of its jaws, which are particularly adapted for the purpose. The mouth organs of beetles and their larvæ, and insects in general, are very different from those of vertebrate animals.

There

There are several pairs of *laterally* moving jaws; one pair of these is in our case very highly developed. With these jaws the larvæ gnaw the tunnels. Each jaw (figs. 6, 7, 8) consists of a broad, roughly speaking, triangular, solid piece of chitine, the horny substance which composes the outer skeleton of the insects. This triangle is a plate, about two and a half times as long as thick, and of nearly equal thickness throughout. The anterior free corner of the triangle encloses the smallest angle of the three; here we find the cutting edge. The two other corners are connected with tendons (fig. 7, *e, f*), which lead down to the muscles moving the jaw (fig. 7, *a, b*). The *outer* one (fig. 6) of these corners encloses a nearly right angle. Here we find on each side of the tabular jaw (fig. 8, *f*) a spherical excrescence—the joint. These two spheres are embedded movably in sockets, and it is around an axis drawn through these two joints that the jaw moves. This axis is vertical.

The muscles attached to the *inner* corner (fig. 7, 8, *a*), the flexores, are very large, and fill the greater part of the cavity of the head. To their very high development the extremely large size of the head must be ascribed. When these muscles contract the jaws are closed on one another, moving horizontally. When, on the other hand, the muscle (*b*), the tensor, is contracted, the jaws move away from one another. These two muscles produce the characteristic pincers-like movement of the jaws.

The anterior cutting edge (fig. 7, 8, *c, d*) is in this way continually moved backwards and forwards, and the grub can produce any desired excavation by applying this scraping mechanism to the wood.

The cutting edge is very sharp (fig. 7), and slightly serrate (fig. 8). The corners of this cutting edge are slightly produced to form teeth, the upper one of which (*c*) is particularly large.

The inner surface of the triangular jaw possesses an S-shaped contour (fig. 7), and is provided with a groove leading down to the mouth (fig. 8). Along this groove the sawdust passes down.

7. *Occurrence.*

The species *Diodoxus erythrurus* has been found in several parts of this and the adjacent colonies.

The beetle is met with in summer, from September until March. The larvæ, of course, can be found always in the pine scrub affected by them. They frequent the lower part of the stem, mainly on the young scrub. Pines of more than 2 inches stem thickness are rarely affected. The larvæ are found in the splint, between bark and wood, and also in the wood itself. It is the rule with insects of this kind to be dependent on a certain species of tree for their food to such an extent that they will perish if not just the right kind of food; the species of tree to which they are accustomed is obtainable for them.

There can be hardly a doubt that this beetle and its larva are entirely dependent on the pine, as even in those places where acres of land had been cleared by the beetle no trace of the insect could be detected on any of the other shrubs which were examined.

8. *The life-history of the insect.*

It is highly probable that the life-history of *Diodoxus* is similar to that of some well-known European species of *buprestidae*, because the numerous stages of the *Diodoxus* which I have observed correspond entirely to similar stages of those European species of the life-history of which has been thoroughly investigated.

I consider myself therefore justified in filling in those gaps between the stages of Diodoxus observed by me by means of comparison with European forms.

The known species of *buprestidae* undergo a complete metamorphosis, that is to say, they pass through three well-defined stages, the caterpillar, the chrysalis, and the beetle.

A "division of labour in time" is expressed in a high degree in this family.

The egg is deposited in the timber, and develops into a small grub. This grub eats its way through the timber and forms irregularly curved passages beneath the bark. This is also done by the Australian species as shown by the specimens. Other timber-devastating beetles make passages of other shapes, and the effect on the tree will of course greatly depend on the shape of these passages.

As the larva or grub proceeds it grows, becomes thicker and longer, and relinquishes its original maggot-like shape more and more. The passages which it forms are of course adapted to its size, and become wider the older the grub gets. These passages are accordingly not cylindrical, but more or less conical.

This grub lives for a long time, that is, for several years, and grows very slowly. Finally, it attains the characteristic nail-shape met with in the larvæ of this family.

When the season comes, which in Europe is mostly the second autumn, the grub forms a chrysalis. It is evident from the above that chrysalis of our beetle will always be found at the wider end of the long conical passage formed by the grub during its relatively long life.

The chrysalis is broader and shorter in proportion than the grub and wedgeshaped.

In Europe the known *buprestidae* remain incisted in the chrysalis throughout the second winter. It is probable that the chrysalis-stage of the Australian species does not last so long, because the climate is not so severe.

When the beetle is formed by the transformation of the grub within the chrysalis it commences to gnaw a passage through the timber in a centrifugal direction. The passages gnawed by the *buprestidae* are remarkable, inasmuch as they are oblique tending upwards and outward, and of a very elongate oval transverse section, pointed lancet-shaped at each end. The beetle has itself such a transverse section, and of course does not excavate more timber than necessary to get through. The shape of this passage represents the shape of the beetle, and is consequently very different from that of the passages made by the grub. On the outer surface of the stem these tunnels terminate with very characteristic apertures, which have a more or less oblique oval shape.

When the beetle has worked his way through the wood he steps out on the bark, and there rests for some time to gather strength for his maiden flight. The beetle flies fast and far. He prefers sunny, warm, dry days to a dull time for his excursions.

The beetle lives only a few weeks, feeding mainly on flowers or leaves. Very soon after he has left the chrysalis the sexual act takes place, and the beetle commences to lay the fructified eggs when he is about six weeks old (the European species). The female possesses an organ, a so-called ovipositor, by means of which it deposits its eggs in the bark of the pine trees. It does not appear probable that the beetle is able to penetrate the thick bark with the ovipositor. He may bite a hole in the bark first, or, what perhaps occurs most

most frequently, he may utilize an already existing interruption in the continuity of the bark—a slight scratch or wound in the bark. Two or three eggs are laid in one and the same place, not more. There are rarely more than that number of grubs in one tree. There the eggs commence to develop into maggots, which feed on the splint, the soft tissue of the tree between bark and wood, and form tunnels extending mostly horizontally in a semi-circle for three-quarters of a circle round the stem. This will often cause the tree to die. After the maggots have become larger they often commence to eat right into the wood, emerging from these inner tunnels occasionally to work along the surface of the timber for a short time. Then again they will gnaw into the wood, until finally they again form chrysalis and turn into beetles.

If we cast a glance at this description we shall perceive that the beetle grows slowly and surely, storing up nourishment and leading a very quiet life as a grub, and then spends the nourishment slowly stored up and saved in a short, happy, and eventful career of flight and exertion, in which period his unconscious aim is to *spread the species.*

This mode of life is characteristic of the beetles and butterflies, and the division of labour in time has led to the very extraordinary complete metamorphosis of these animals.

9. *The Structure of the Pine Stem.*

The bark of the young plants is smooth, and only 0·08 inches thick. It can easily be penetrated by the ovipositor of the female beetle, and so the larvæ are found very frequently in these young pines. So thin a bark is found on stems under 0·8 inches diameter. The bark soon increases in thickness, and already on stems 2 inches in diameter attains a thickness of 0·3 inches. It loses its smoothness, and soon becomes transversed by mostly longitudinal breakages, which roughen it more and more. The bark on the large trees is very rough and 0·5–0·8 inches thick.

The microscopic structure of callitris-wood shows no peculiarity. As in other coniferæ, the cambiform and trellis-cells are found exclusively in the soft bast below the bark. The yearly rings are narrow and irregular, in consequence of the unseasoned climate of the locality. The pine grows twice as rapidly in soft earth than on rocks, and the timber of the rock-pine is accordingly very much harder than that of the pine growing in soft earth.

10. *The Physiological Effect of Ringbarking on Plants.*

It is a fact known for many centuries that by cutting through the bark of certain trees, by ringbarking them, they are killed, whereas other trees treated in a similar manner are not affected much, and soon recover from the wound.

The different effect of ringbarking on different trees has been explained by Hanstein* and Sachs†. The experiments of the former have shown that only those trees are killed by ringbarking which do not possess any scattered fibro-vascular bundles nor any threads of trellis and cambiform cells in the interior of the stem, the pith. If such a tree is rung, a thick mass of lenticells and sometimes also roots are produced on the upper margin of the ring. If the lenticells can cover it in any portion of the removed ring before the tree has died, then it will recover, but not otherwise.

On the lower margin of the ring adventive buds are incited to produce shoots in a similar manner, as if the stem had been cut off instead of being only ringbarked.

There are Dicotyledons in the stems of which threads of cambiform and trellis cells occur, but no fibro-vascular bundles (*Asclepideæ, Apocyneæ, Solaneæ*), and others where, as it is the rule in Monocotyledons, also fibro-vascular bundles are present in the interior of the stem (*Piperaceæ, Mirabilis, &c.*) In all these plants the supply of nourishing material to the parts below the ring from the organs above is not interrupted by ringbarking, and the plant will continue to grow after it has been rung.

Sachs (*l.c.*) gave the explanation for this. He showed that the hydrocarbons (starch, sugar, &c.) travel mainly along the circumference of the fibro-vascular bundles, in trees, also in the wood; and further, that the nitrogenous substances mainly move along the cambiform and trellis-cells which form the soft part of all fibro-vascular bundles, and are exclusively found in the inner portion of the bark of Dicotyledons. As both kinds of substances are necessary to nourish the plant, it is evident that that part of the plant must die from which the supply of either is cut off. If, therefore, the tissue along which this nourishing material flows be cut through the plant will be killed. A very small portion of the nitrogenous substances travel also along the wood, so that exceptionally it may be possible for a tree to overcome the bad effects of ringbarking, and the ring may heal over.

11. *Influence of the Insect on the Pine.*

The larva of our beetle ringbarks the pine trees in its way, and the effect is precisely similar to that described in the above chapter.

The ovum is deposited in the thin cylindrical layer of soft bast which lies between the wood and the bark, and which is so essential to the life of the tree as the only canal through which certain most necessary nourishing substances flow.

The maggot which issues from the egg is much too small and weak to be able to attack the hard timber, and so it naturally eats its way along the cylindrical layer of soft bast between the bark and wood, which is much softer, and which contains more nourishment for the grub than either the wood or the bark.

If our grub were to follow a longitudinal course, and gnaw out a tunnel running up or down the stem, it would not affect the tree any more than a longitudinal cut in the bark would do; it would have no perceptible injurious effects, because the longitudinal supply canals in the soft bast would remain mostly uninjured.

But, extraordinary to say, the grub does not take this evidently easiest course, but, on the contrary (plate II, fig. 11), gnaws a horizontal transverse passage right round the stem. These transverse canals are very characteristic of our grub; they extend, as mentioned above, more or less far round the stem; sometimes right round, sometimes half to three-quarters of the circumference. The advantage which the grub attains by cutting these transverse canals can easily be comprehended: all the vertical sap-canals are cut through, and an abundance of nourishing material for the pine is poured into the tunnel from above and below. The grub doubtlessly licks up that sap, and lives on it to a great extent.

After

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* Pringsheims Jahrbuch für wissenschaftliche Botanik. Band II. † Experimental—Physiologie Seite, 331-386.

After the grub has worked more or less round the stem, it either enters the stem and commences to work a tunnel right through the wood, or it changes the direction of the surface canal and burrows along in varying crooked lines, which may, particularly in very slender stems, become more or less longitudinal (plate II, fig. 9). At another point it may again commence a horizontal tunnel round the stem, and in this way cut through the few supply canals, perhaps, which were not destroyed by the formation of the first circular tunnel.

It is clear that the effect of this would be exactly the same as that of ringbarking. *Our grub actually ringbarks the pine scrub.*

Were it not for these transverse tunnels the grub would not be nearly so destructive.

When the pine is dying in consequence of having been rung by the grub, then the soft bast dries up, and the larva, already large and strong, commences to burrow in the interior of the wood only. It seeks those places where it is most likely to find sap, and, therefore, invariably burrows down to the lower termination of the stem, there eating the wood of the stem and the main root, which extends vertically downward, as in other coniferæ, until a nice trellice-work of thin wood is left around the cavities, gnawed out by the larvæ (plate II, fig. 10).

By this time the larva has grown up and the pine is quite dead. It forms its chrysalis near the great excavation, and turns therein into a beetle.

A pine is known to linger for twelve months when rung only through the soft bast, but it dries in one month, when the whole of the white wood is cut through, down to the dark central part. (Mr. T. Glynn.)

The work of our grub belongs to the first category; the pine lives for a year after it has been rung by the grub. Firstly, the highest tips of the green boughs shrivel up and turn brown. This process extends further and further downwards, until the whole plant is brown. Leaves and branches are broken off. The stems alone hold out a little longer, until also these, weakened at the base by the excavations of the grub, give way to a heavy gust of wind, or are broken down by stock or wild animals.

If the grub were to attack the stems *above* the lowest branches they could not kill the trees, because these branches and their leaves would remain alive, even after the top, the part above the spot rung by the grub, has withered and died. But the grub invariably—I have examined many hundred specimens—attacks the pine-stem at its base.

I am inclined to believe that most of the pines attacked by the grub die, but this, of course, is only an assumption.

12. *The effects observed.*

In the vicinity of the township of Nymagee, all along the road from that place to Condobolin, in the south (Hon. Mr. Copeland), and also to the west (Mr. T. Glynn), between Nymagee and Nangerybone, and in the vicinity of Melrose, patches of pine scrub have been observed to die out, without an apparent reason. The Hon. Mr. Copeland has made it highly probable that on the Nymagee-Condobolin Road this grub is the cause of their dying. I have examined hundreds of specimens in the localities mentioned above, and I think that there can be no doubt that this grub kills the pines. Large areas on the property of Mr. Glynn formerly covered with pine scrub are now cleared; only a dead, dried, and half-decayed stem, which can be broken down with one finger, here and there, testifies to the pre-existence of scrub in the locality. Around this area there is a belt of dying pines. There are several clear patches surrounded by similar belts in other localities.

I do not think that the recent drought can have anything to do with the dying of the pine, because the patches where the scrub has vanished are found indiscriminately in elevations and in damp hollows.

The drought would certainly favour the beetle in his flights.

13. *Practical Results and Suggestions.*

1. The pine scrub covers many hundred square miles.
2. It would be of great advantage to the Colony to have this scrub cleared.
3. There exists a beetle, *Diadoxus erythrurus*, which in its lava stage kills the pines it attacks, and clears the scrub.
4. This biological fact can be turned to practical account, if point (2) be accepted as correct.

If the grub and beetle were kept in store so that they could always be supplied to any squatter desirous of clearing the pine scrub, this (point 4) could be done. Although the grub is very hardy, and lives in a bottle without food for a fortnight, still it would seem better to use the beetle for the purpose of distributing the species. One female beetle lays a great many, probably hundreds of eggs, and would, if let out in a pine scrub, affect a great many plants. *One pair* of beetles per square mile would be sufficient to clear it within twelve years. It would be necessary, however, for the purpose of having a large stock of beetles always at hand, to breed them artificially in the manner I suggested in my previous report, by covering some affected pines with a fine net or wire gauze to prevent the escape of the beetle.

At the right season, in early summer or spring, beetles could easily be caught in great numbers, and might be procured at a cost of about 2s. a hundred, of which about half or more would be females.

If once established in a certain district the beetle will multiply; but as the larvæ live for years the rate of increase will not be very fast.

If we assume that the development from the egg to the beetle takes three years, and that each female beetle lays 200 eggs, the rate of increase would be as follows:—

1st	year.....	2 beetles.....	(1 pair.)
2nd	„	200 grubs.	
3rd	„	200 grubs.	
4th	„	200 beetles.....	(100 pair.)
5th	„	20,000 grubs.	
6th	„	20,000 grubs.	
7th	„	20,000 beetles.....	(10,000 pair.)
8th	„	2,000,000 grubs.	
9th	„	2,000,000 grubs.	
10th	„	2,000,000 beetles.....	(1,000,000 pair.)
11th	„	200,000,000 grubs.	
12th	„	200,000,000 grubs.	

Let

Let us assume that half of these perish, then it is clear that 100,000,000 large grubs will be the offspring of one pair of beetles in twelve years. If we now assume that there are in the pine scrub country, taking it all through, two pines to the square yard, we shall have 6,000,000 to the square mile. There are, as mentioned above, only a few grubs, two to four, in each pine affected, so that it will require 18,000,000 grubs to clear this area. But we have, after twelve years out of each pair of beetles, 100,000,000 of grubs, so that it would be easy to clear a square mile of pine scrub in twelve years with one pair of beetles!

Of course, by applying 100 pairs of beetles, for instance, per square mile, there would be a sufficient number of grubs to destroy the scrub in half that time.

With a greater number, of course a better and quicker result will be obtained in proportion.

When the pine scrub has been exterminated the insect will also become less numerous, as it is not able to live on any other plant.

When the pine scrub used to be kept down by bush-fires the insect was scarce. Now that the fires are put a stop to the pine scrub flourishes, and its natural enemy the *Diodoxus* increases in number proportionately. It will decrease again when its own ravages have caused the pine scrub to become scarce.

Explanation of Plates.

Plate I.—*Diodoxus erythrurus* and the structure of its principal jaw :—

Fig. 1. The male beetle, natural size, caught flying, in February.
Fig. 2. The female beetle, natural size, in February.
Fig. 3. The Larva adult, ready to form a chrysalis from a part of the pine represented in fig. 10 ; natural size.
Fig. 4. The Larva not so highly developed ; natural size.
Fig. 5. Young Larva, about three or four (?) months old from the pine, represented in fig. 11 ; natural size.
Fig. 6. The principal (anterior) pair of jaws of the larva, seen from above ; magnified 20 diameters.
Fig. 7. One of the jaws represented in fig. 6, seen from below ; magnified 30 diameters.
Fig. 8. The same jaw seen from within. The face *c.c.*, appears in fig. 7 en profile, and in fig. 8 en face.

The letters in figs. 7 and 8 have the following meaning :—

(*a*) Muscles to move the jaws towards each other. *Flexores mandibuli anterii.*
(*b*) Muscle to move the jaws away from each other. *Tensor mandibuli anterii.*
(*c*) Upper tooth on the cutting margin of the jaw.
(*d*) Lower tooth on the cutting margin of the jaw.
(*e*) Insertion of the *Tendon Flexoris* in the jaw.
(*f*) Joints on which the jaw articulates.

Plate II.—Pine stems affected by the larva of *diodoxus erythrurus* derived of the bark in natural size.

Fig. 9. Portion of the stem of a young pine 6 feet high, 2 feet above the ground. The tips of the branches appeared withered, otherwise the tree was green ; larvæ middle-sized.
Fig. 10. Portion of the main root and base of stem of a pine tree 5 feet high. Just below the ground the stem is eaten more than half away. The tree was dead, the larvæ in it alive and nearly adult. (Fig. 3.)
Fig. 11. Portion of the stem of an apparently dying pine, about 20 feet high, 3 feet above the ground ; the larvæ alive, but small. (Fig. 5.)

May I hope that the results of this investigation will be of practical use to the owner of the land, the Government, and the tenants of the land, the squatters.

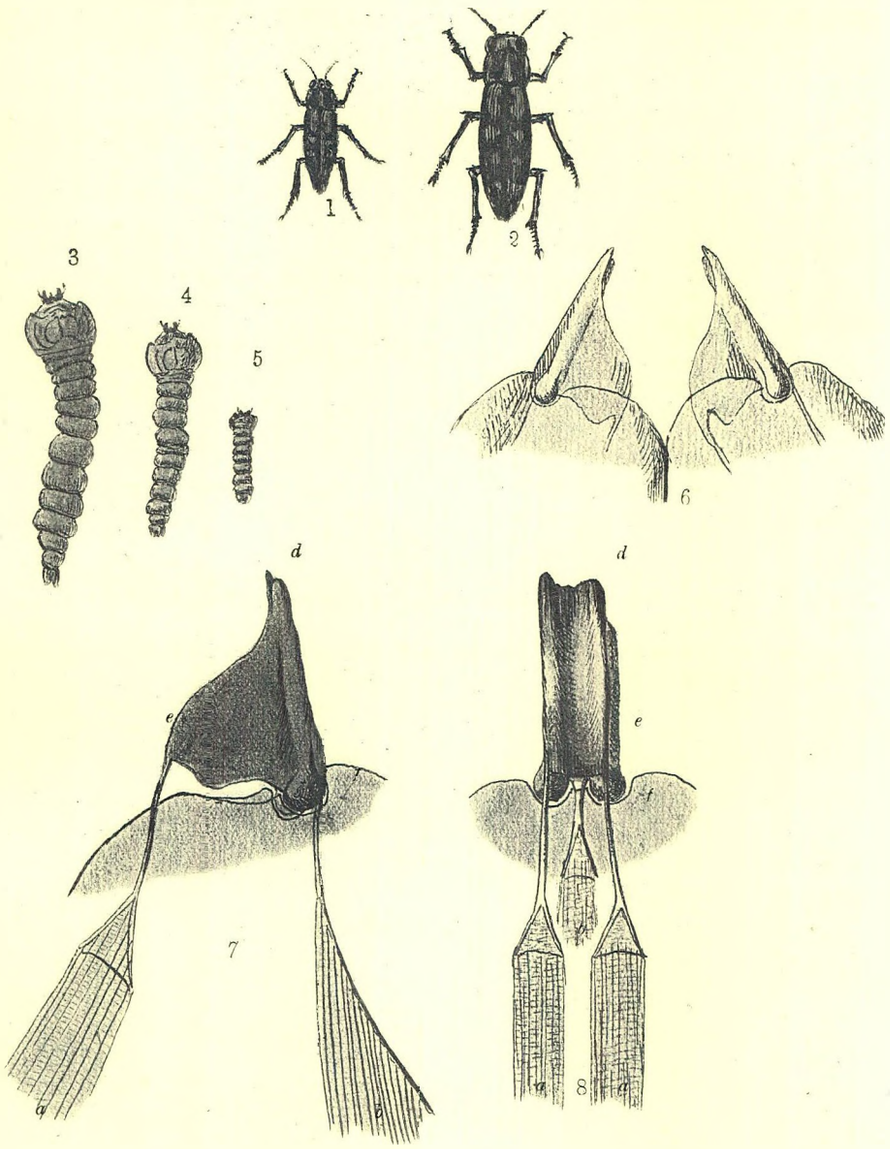
I have, &c.,
Dr. R. v. LENDENFELD.

[Two plates.]

Sydney : Thomas Richards, Government Printer.—1885.

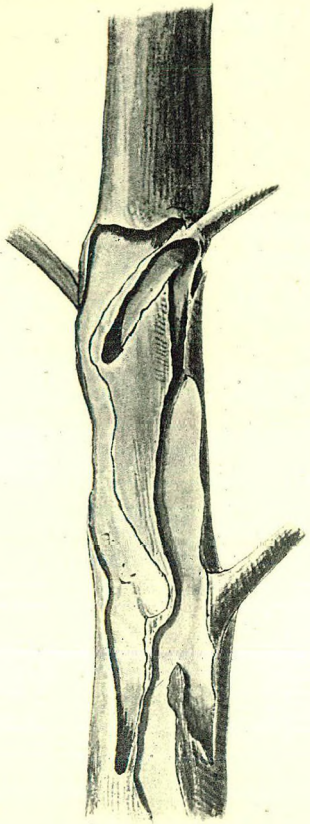
[2s.]

PLATE I.



V. Lendenfeld, del.

PLATE II.



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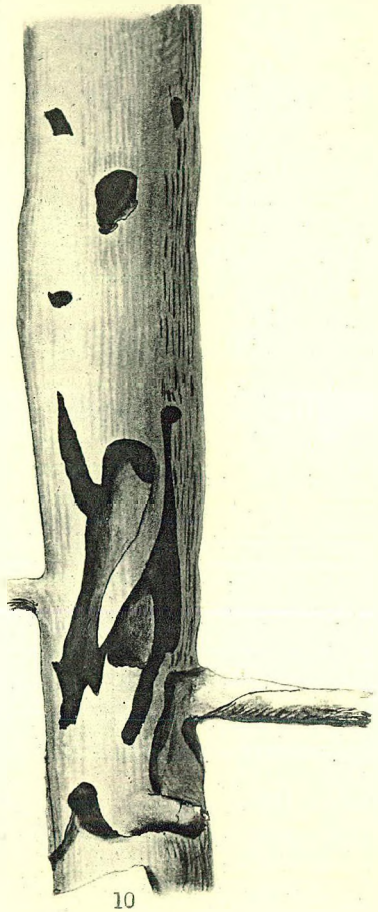

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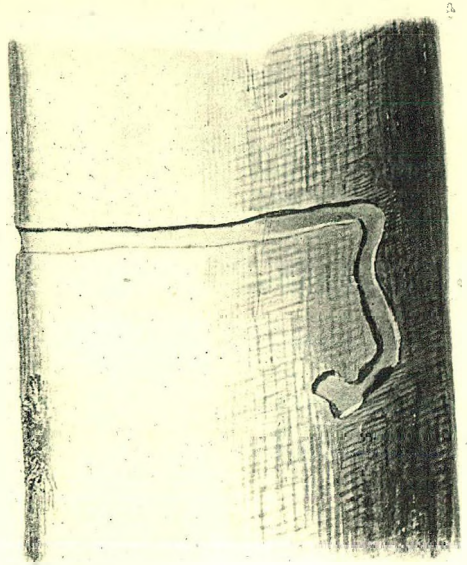

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V. Lendenfeld, del.

1885–6.

NEW SOUTH WALES.

FOREST BRANCH, DEPARTMENT OF MINES.

(ANNUAL REPORT.)

Printed in accordance with Resolutions of both Houses of Parliament.

To the Honorable James Fletcher, Esq., M.P., Minister for Mines, &c., &c.

Sir,

In submitting the reports upon the working of the Forest Branch for the year 1885, I have much pleasure in bearing testimony to the efficiency of the officers of this Branch. I must, at the same time, apologise for the lateness of this report, due mainly to the fact that the officers of the Branch have, until recently, been so much engaged in preparing for the Colonial and Indian Exhibition. The revenue of the Branch collected during 1885 is less than that of 1884 by £4,387 3s., chiefly due to the decreased demand in Victoria for the timbers of this Colony; but it is quite possible that a demand for these timbers would arise in other countries if they were better known outside the limits of Australia. With a view to disseminate information concerning the qualities and uses of these timbers, much care and attention was devoted to the collection and preparation of samples for the Colonial and Indian Exhibition about to be opened in London. In this work I personally took a great interest, and I feel much indebted to Mr. Duff, the Inspector of Forests, and Mr. Piper, the Chief Clerk, for their most valuable assistance. I also gladly recognise able and zealous services in this matter of Mr. Rudder and some of the other Forest Rangers. It is quite possible, however, that full justice was not done to some of the timbers, as, owing to the very limited time available for collection and preparation, some of the samples could not be properly seasoned. It is to be feared that the collection is deficient in samples of veneers, partly due to sundry articles of furniture which had been ordered not having been supplied in time for transmission, and partly to the fact that the sending of veneers in sheets was overlooked. It is thought that the samples of engraving woods and fibres sent to the Exhibition, which were carefully prepared and described by the Inspector of Forests, may have the effect of creating a demand for them outside this Colony.

Last year (for the first time since 1877) the cost of conducting the work of the Branch exceeded the revenue collected. This is probably due to the causes assigned by the Chief Clerk in his report, seeing the Regulations of the 18th August last are practically the same as those of the 24th September, 1878, so far as regards reserves which are subject to royalty; therefore the falling off in the revenue cannot be ascribed to any reduction in the rate of royalty chargeable, consequently, it must be due to a decreased demand. The revenue for the present year (1886), however, shows signs of recovery.

The following statement shows the decrease occurs mainly in the receipts from royalty and ring-barking trees:—

	1884.	1885.
Revenue from reserves subject to royalty	£8,392 13 10	£4,588 12 8
Ringbarking fees	650 5 0	39 2 6
Revenue from all other Timber and Quarry Licenses ...	8,679 5 0	8,695 10 0
Seizures	528 1 10	539 17 6

The area of reserved timber land is 5,675,950 acres. Quantity of timber cut upon 2,382,406 acres subject to royalty, 6,860,512 superficial feet, besides 828 trees. No account is kept of the quantity of timber cut on other reserves and Crown lands. The quantity of timber shipped from ports other than Sydney and Newcastle, 62,669,310 superficial feet. The value of timber exported was £54,931.

During the year attention was invited to a disease in maize, known in the coast districts as "maize blight"; but as no reports on the subject were received during the year to which this report refers, I shall perhaps be pardoned for referring here to the action taken and reports received during the early part of 1886; and, in doing so, I desire to express my obligation to Mr. W. S. Campbell, the Chief Draftsman of this Department, for the able assistance he has so cheerfully given me. The following is the report on the first samples submitted:—

Sir, Department of Mines, Charting Branch, 15th February, 1886.

I beg most respectfully to submit, for the information of the Hon. the Minister for Mines, a most exhaustive report, by E. Haviland, Esq., F.L.S., on the "Maize Disease."

The specimens examined by Mr. Haviland were obtained by Mr. Forest Ranger Wilson from four farms on the Hastings River.

I have, &c.,
WALTER S. CAMPBELL.

The Under Secretary for Mines.

[1,258 copies—Approximate Cost of Printing (labour and material), £27 12s. 9d.]

REPORT on four samples of Maize received from River Hastings; by E. Haviland, F.L.S.

I HAVE most carefully and minutely examined the four parcels, consisting of nine plants of diseased maize procured from the River Hastings.

I find that this disease, known to the farmers in the Northern districts of the Colony as "blight," is caused by the microscopic fungus *Ustilago candollei*. The fungus appears, as a rule, to make its first attack upon the leaves of the plant; its mycelium, which in some respects may be compared with a creeping root, penetrating the leaf, and not only robbing it of its sap, but choking the sap vessels. The mycelium is shortly succeeded by pseudo spores, which produce true spores, and these true spores in their turn produce secondary spores, the secondary spores reproducing the mycelium, and so completing the circle. All these spores choke and clog the tissues of the leaves, preventing the free flowing of the sap. The leaves, being thus to a great extent deprived of their nourishment, wither and die.

It is the duty of the leaves to receive the crude sap from the roots, and, by exposing it spread out over their broad surfaces to the atmosphere, to elaborate and render it fit to be returned as food for the plant; but their destruction preventing this, the other portions of the plant are left to sustain life as long as they can by means of the crude, unelaborated sap only. The plant, of course, soon becomes deprived, or almost deprived, of its vital energy, and is left in the same position as any other inanimate organic matter when exposed to damp and warmth—liable to decay and to the attacks of "moulds" and "mildews." Accordingly, I find that the close sheathing parts, where the leaf joins the stem, have been attacked by the mould common on decaying vegetable matter, *Aspergillus glaucus*, and that the holding of moisture between the several grains has induced decay, hastened by the growth of this "mould," until the point of attachment has been destroyed, and the grains have fallen, leaving the "cob" partly naked. I estimate that of the five "cobs" accompanying these samples fully 40 per cent. of the grain has been thus lost. I have found no trace of disease either in the stems or roots of these samples, and only in few instances in the ovaries.

Nothing, I think, can be done to save a crop when once affected; *but I should earnestly advise those concerned, as preventive measures for future crops, to destroy by fire all culms, roots, and leaves of the present diseased crop;* to avoid planting maize, year after year, upon the same ground; to obtain seed for the next planting from some distant source, where it can be ascertained that there has been no disease; and by taking such measures, best known to practical farmers, as are likely to increase the vigour of the crop, and thus to give it every chance of resisting the attacks of this fungus should it again make its appearance.

I append particulars of the examination of each parcel:—

Sample No. 1.—*Three plants, A, B, C.*

A.—Stem small and attenuated, but fresh and green. The whole of the leaves dead throughout their entire length, and clouded by spores of the fungus under the cuticle. This specimen bears a "cob," the sheathing leaves of which are free from disease. The "cob" is well formed upon side only, the grains full and plump; but upon the other side more than half the grains have been lost, the ovule shrinking within the testa in some grains, the others having rotted quite away. As there is no appearance of the fungus *Ustilago* in the "cob," this diseased state has been caused by the destruction by that fungus of other parts of the plant.

B.—In a portion of the sheathing of the "cob" the mycelium of the fungus *Ustilago* remained, and with masses of pseudo and true spores, forming a grumous mixture, completely choked the vessels. In a second "cob" two-thirds of the grains had disappeared, and many of those that remained presented a shrivelled half rotten appearance, covered by the mould *Aspergillus glaucus*, and by the mycelium of the *Ustilago*. In this specimen I found many of the pseudo spores in the ovary.

C.—A young plant. The lower leaves of this plant were completely covered with pseudo spores, but the upper leaves were clean.

No. 2.—*Two plants, A and B.*

A.—The sheathing portion of the leaves much diseased, and covered to some extent along the leaves by cloudy markings formed of spores on the surface of the cuticle, but attached to it. The "cob" attached to this specimen was half stripped of its grains, but those that remained were healthy. The receptacles of the grains that had disappeared were much decayed and covered by "mould." No trace of the fungus *Ustilago* in the ovary.

B.—In the "cob" about a third of the grains had decayed. Sheathing leaves all clean. No disease in the ovary. This specimen showed symptoms of disease at the nodes (joints) of the stem; but although some of the pseudo spores and mycelium were present, I could not trace the disease beyond the cuticle.

No. 3.—*Three plants, A, B, C. Young plants, planted first week in December.*

A.—This specimen could scarcely be said to be diseased. There were a few pseudo spores here and there on the surface, perhaps from other plants, and the mycelium present in isolated spots. Apparently it had been very recently attacked.

Same remarks will apply to *B* and *C*.

No. 4.—*Three plants, A, B, C, from Rawdon Island, River Hastings; also D, one young plant, planted 24th December.*

A.—Leaves but slightly diseased; "cob" nearly half destroyed; inner sheathing of the "cob" clean; outer sheathing diseased; pseudo spores in the empty receptacles of the missing grains; some few spores in the ovary *germinating*.

B.—Leaves very much diseased; particles of decayed matter, taken from the abortive "cob" contained the pseudo, primary, and secondary spores. In this plant the "cob" had failed entirely, leaving only a small mass of matter containing hundreds of the secondary spores.

C.—The leaves mostly diseased, extending somewhat to the cuticle of the stem; only a few grains of the "cob" lost; some of those left had pseudo spores in the ovaries.

D.—Scarcely affected.

In

In submitting Mr. Haviland's report upon the Maize Disease, I desire to point out that that gentleman has evidently devoted much care and attention to the subject, that he is specially qualified for the duty, and that he kindly volunteered his services without fee or reward of any kind. I gather, from the report and from a conversation with Mr. Campbell, that the remedy is the destruction by fire of the roots and other remains of the infected crop, the drainage of the land, the planting of other crops for a year or two, and, when the planting of maize is resumed, the procuring of seed from a distant and uninfected district.

I submit that the best thanks of the Department are due to Mr. Haviland, that thanks are also due to Mr. W. S. Campbell (Chief Draftsman in this Department) for the action he has taken in the matter, and that the papers be printed and copies forwarded to the Members of the Northern Coast Districts for distribution, and to the Press.

H. W., 16/2/86.

The report may be printed and the thanks of the Department conveyed to Messrs. Haviland and Campbell.—R.M.V., 17/2/86.

The following letter from the Curator of the Botanical Gardens contains the advice of that gentleman upon the subject generally before any specimens had been submitted to him :—

Sir, Botanic Gardens, Sydney, 25 February, 1886.

With reference to the accompanying letters (from John See, Esq., M.P.) on the subject of the disease with which some of the maize crops in the northern districts are affected, I would state that, although I have not seen any form of the disease, yet, from all I have heard, it is undoubtedly caused by a fungoid growth similar in its effects to the rust in wheat.

I shall be glad to get specimens of it for examination, and, in the meantime, I would most strongly recommend that wherever the disease makes its appearance the plant on which it is found should be at once cut down to the base, the cuttings placed on a heap away from the other crops, and burnt as soon as possible thereafter.

I have, &c.,

The Principal Under Secretary. CHARLES MOORE.

The following is a copy of a circular sent to Forest Rangers :—

Sir, Department of Mines, Forest Branch, Sydney, 1886.

With reference to your appointment as a Forest Ranger, I have to inform you that you should invite, and as far as possible assist, farmers and others in the district assigned to you, who are troubled with diseases in their crops, to forward specimens to this Department.

When such specimens are received, every endeavour will be made to have the nature of the disease investigated.

You should make this known generally throughout your district.

I have, &c.,

Mr. Forest Ranger Under Secretary.

In response to which Mr. Forest Ranger Wilson sent twenty-one samples from farms on the Hasting River, which were submitted to Mr. E. Haviland, F.L.S., who reported as follows :—

Report on six parcels, consisting of twenty-one plants of maize, received from Department of Mines; by E. Haviland, F.L.S.

The twenty-one plants of maize received by me, and which I believe were grown on the River Hastings, have had my most careful attention. I have examined every part of each plant separately and microscopically, and have found, as in the previous parcels upon which I reported in February last, the whole of the plants infested, in a greater or lesser degree, by the microscopic fungus, *Ustilago Candollei*.

In my report above referred to, I explained the mode of attack of this fungus and the manner in which the plant is destroyed by it, which it will therefore not be necessary to repeat; but I must draw especial attention to the examination of the plant *A* in the parcel No. 1, from the farm of Mr. John Hyde (see particulars of examination annexed.) This plant was almost entirely destroyed. A portion reserved shows that nearly the whole of the vascular and cellular tissues were either choked by the protospores of the fungus or decayed and rendered incapable of conveying and distributing the sap. It would be exceedingly interesting and instructive to know under what conditions of soil, drainage, &c., this plant was grown, and I may here add that in all cases of the examination of diseased crops, such knowledge would be productive of future valuable statistical information. In the parcel No. 2, from Mr. Lockton, it will be seen that, while the plants *A* and *B* were comparatively healthy, *C* was diseased in an aggravated form. The question naturally arises—Were these three plants portions of the same crop, planted at the same time, and under similar circumstances; or, under what conditions do their states differ so materially ?—a question which could perhaps only be answered by actual inspection of the crop while growing, or by careful inquiries made on the spot.

I wish also to take advantage of this opportunity to state that the protospores of this fungus possess the property of decomposing the tissues of the plant in their immediate neighbourhood, each one forming a centre of action upon the adjacent parts.

It will be observed that in this report I have made use of the word "Protospore." This I have substituted for "Pseudospore," used in my last report, as I considered it the more correct application.

I append particulars of examination of each parcel.

PARCEL No. 1.

Two plants, A, B, from Mr. John Hyde.

A.—This plant much impoverished and infested throughout by the fungus *Ustilago Condollei*. The two "cobs" upon it are small and bare, neither of them containing more than ten or twelve grains, the others having either shrivelled from want of nourishment (the sap vessels being destroyed by the fungus), or, becoming soft and rotten, have fallen an easy prey to insects, especially the common "ear-wig" (*Forficula*)—an insect very destructive to the softer portions of plants, and of which I find very many in these cobs. A transverse section of the leaf of this plant, shows the fungus completely through its substance, and the whole of the sap vessels destroyed.

B.—

C.—The leaves quite destroyed by the fungus and the plant generally in the same condition as *A*, but in a somewhat less degree. This plant bears two "cobs"—one only partially formed, the other contains only a few half-formed grains.

PARCEL No. 2.

Three plants A, B, C, from Mr. J. Lockton.

A.—In this plant the fungus, although it has penetrated the cuticle of the stem, has but slightly affected the leaves. It is, therefore, in a comparatively healthy state. It bears one "cob," which is sound and well formed; a few grains only are missing, which have probably been picked off by the hand.

B.—The above remarks will also apply to this plant, excepting that the "cob" has been pulled off. The sheathing of the "cob" is, however, quite healthy. These two plants are stouter and of more vigorous growth than any, at all affected by the fungus, that I have examined.

C.—In this plant the sap vessels of the leaves are either nearly all destroyed by the the decomposing property of the fungus, or choked by the protospores. The grain and ovaries are also to some extent affected. Although as tall as *A* and *B*, the diameter of its stem is not more than half that of those specimens. This plant bears two "cobs"—one about half destroyed, the other a mere rotten mass.

PARCEL No. 3.

Six plants, A, B, C, D, E, F, from Mr. James Dicks.

A.—A very sickly-looking plant. In many of the leaves the protospores of the fungus are deeply imbedded in the tissue in waved bands extending across the base of the leaf, and cutting off all communication of the sap between the stem and the leaf. A transverse section of the leaf shows the fungus very deeply embedded. At all the joints, both the mycelium of the *Ustilago* and other fungi (mildews and moulds) have made their appearance. There is no "cob" on this plant.

B.—Not so badly affected as the preceding specimen, yet the "protospores" of the fungus are making their way through the leaves in isolated patches.

C.—In this specimen the sheathing portions of the leaves are altogether destroyed presenting, under the microscope, the appearance of small broken tubes filled with purple beads. Two small "cobs," which do not exceed an inch in length, are reduced to rotten masses.

D.—All the leaves infested by the "protospores" and in some parts by the mycelium of the fungus. One cob; grains not developed.

E.—Although slightly affected, a tolerably healthy plant.

F.—Not only all the leaves but the cuticle of the stem badly affected. "Cob" partially destroyed, the shrivelled grains remaining on it.

PARCEL No. 4.

Five plants, A, B, C, D, E, from Mr. Tuffin.

A.—Leaves entirely infested by the fungus both in its mycelium and "protospore" forms. There is no leaf on this plant capable of performing the necessary duties of transporation and elaboration of the sap. It appears to have been attacked late, as one "cob" is large and well formed, and has lost but a few grains, while a younger one is completely shrivelled, though only 3 inches long.

B.—This plant slightly affected only. "Cob" small but sound.

C.—Leaves covered by the "protospores," which are also deeply imbedded in them. One "cob" only on this plant, most of its grains rotten.

D.—This specimen, with the exception of *A*, in parcel No. 1, is the worst affected of any, the protospores so clogging the tissues as to make it impossible for the sap, even if it could pass in its thin and crude state, to return when it is thickened and elaborated as food for the plant. In consequence of this, the stem, although mature, is not more than three quarters of an inch in diameter, and its one "cob" but 2 inches long and without grains.

E.—As nearly as possible in the same condition.

PARCEL No. 5.

Three plants, A, B, C, from Mr. Clapson.

A.—Leaves destroyed by the fungus which has penetrated quite through them. Under the microscope these leaves have the appearance of having been washed over with some adhesive matter, and that then the "protospores" of the fungus had been thickly strewn over them. One "cob" on this plant, the grain checked and undeveloped by want of nourishment.

B.—Leaves in a similar condition. No "cob" on this plant.

C.—Not so badly affected, the upper leaves only containing the "protospores."

PARCEL No. 6.

Two plants, A, B, from Mr. Law.

A.—All the sap vessels of the leaves quite destroyed by the fungus throughout their entire length. One "cob" on this plant, the grains formed on one side only.

B.—Equally bad. No "cob" on this plant.

Mr. Haviland also favoured the Department with the following report upon two samples of maize grown at Gosford:—

"REPORT on two samples of Maize grown at Gosford and received from Department of Mines; by E. Haviland, F.L.S.

"*A.*—A very stout and robust plant, 15 feet high, and nearly 7 inches in circumference at the base, bearing two cobs—one cob large, well-shaped, and healthy, excepting that it had lost about fifteen or twenty of its grains from the apex. One grain only, which fell off during examination, was decayed at the point of connection with the "rachis," and this decayed portion was covered by mycelium of the fungus *Ustilago candollei*. The outer sheathing of the "cob" also was infested by the mycelium and protospores of the fungus, but the inner sheathing and the remainder of the cob were clean and healthy. A second and much younger cob on this plant had quite failed to form its grains, and completely perished. The *laminæ* (blades) of the whole of the leaves were clean and free from the fungus, or nearly so, and, though withered and dead, appeared, at first sight, to have become so simply in the ordinary course after the

the plant had been taken from the ground; but upon stripping the leaves down and examining the sheathing portions in contact with the stem, they were at once seen to be completely infested and destroyed by the fungus, and sections under the microscope showed that every sap-vessel, without exception, in each leaf was choked by the protospores. Thus all the sap that should have been passed through the leaves, and consequently all nourishment to the plant generally, had been cut off at its very point of ingress; hence the dead leaves and the abortive "cob." This must, however, have happened after the plant had attained its full growth and the first cob was mature, but before the second cob had formed its grains.

"*B.*—This specimen was but the upper portion of a plant. One cob only upon it and that passably well formed, but its outer sheathing badly infested by the protospores of the fungus, and the leaves in the same condition as the specimen *A*. This plant also appears to have been attacked late.

"From the many specimens that I have had opportunities of examining I am of opinion that this fungoid disease, so disastrous to the maize crops of the past season, originated between the Tweed and Richmond Rivers, from thence proceeding southward to the close vicinity of Sydney. I have not yet heard of it in the Southern Districts, but it may have been present to some extent there also."

In view of the fact that the reports furnished to the Technological Board, upon samples of maize, differ materially from the foregoing, both as to the cause and nature of the disease, I should have withheld Mr. Haviland's reports until they could have been submitted to some unquestionable authority, but that it may perhaps be desirable that persons interested in maize growing should have the full benefit of the labors both of Dr. Morris and Mr. Haviland, and that the opinions of these gentlemen may be fully discussed.

Forest Ranger Martin recommends that seed for planting in the localities where the crops have been affected by the disease be procured from the Camden district.

The report furnished by the Inspector of Forests shows a record of valuable work performed by that officer during the year. The report also contains suggestions well worthy of favourable consideration.

Mr. Duff reports that about fifty of the black walnut-trees planted out died during the hot dry weather of last summer, while the efforts to raise the rain-tree from seeds procured from Calcutta failed through cold during our winter season.

The plantation of wattle on the Southern Railway line has not been altogether successful, and has been somewhat costly for the results obtained, owing to adverse conditions attending such plantations on the narrow strips of land along the railway; and the Inspector repeats his objection to the formation of plantations in such positions. Nevertheless, after thinning out in May last, there were 6,690 trees along the line from Minto to Burradoo, comprising black, green, and golden wattle.

Much useful work has been done in connection with the plantations of the catalpa at Cootamundra and East Maitland respectively.

TOTAL number and species of trees planted from the year 1882 up to 1885 inclusive.

At East Maitland.

221 Catalpa Speciosa,	221 Juglans nigra. Black walnut.

At Cootamundra.

613 Catalpa speciosa.	83 Pinus insignis. Californian pine.
121 Juglans nigra. Black walnut.	5 Eugenia Ventenattii. Water gum.
61 Syncarpia laurifolia. Turpentine.	18 Quercus ilex. Evergreen oak.
94 Eucalyptus. Various species.	51 Fraxinus Americana. American Ash-tree.
29 Grevillea robusta. Silky oak.	37 Quercus virens. Evergreen oak.
225 Sterculia diversifolia. Kurrajong.	35 Laurus camphora. Camphor-tree.
3 Melaleuca leucadendron. Tea-tree.	24 Araucaria Cunninghamii. Pine-tree.
25 Tristania conferta. Brush box.	8 Olea Europæa. Olive-tree.

It is to be regretted that of the 1,000 American ash-trees presented by the Conservator of Forests in South Australia only about one dozen survived the journey.

Under the direction of the Inspector the work of cedar planting in the Forest Reserves has progressed most satisfactorily. A large number of seedling plants have been collected and planted out in all the open parts of the Dorrigo Reserve, besides a number of cedar root-cuttings. A considerable amount of work has been done in clearing around and otherwise protecting self-sown cedar-trees, of which there are a large number in the Dorrigo Reserve. The total number of red cedar-trees (*cedrela australis*) planted and self-sown seedlings counted on the Dorrigo Forest Reserve was 8,258, and 300 root-cuttings.

Some time was devoted to the selection of a suitable site for a State Forest Nursery. Two sites were eventually submitted for consideration, but, owing to objections raised, great difficulty has been experienced in deciding upon the site best suited for the purpose, and consequently the work of preparing the nursery has been delayed.

The list of the timber specimens sent to the Colonial and Indian Exhibition prepared by Mr. Duff reflects great credit upon him, and will, if distributed amongst the Forest Rangers, prove most useful to them in the discharge of their duties.

I am happy to say that, notwithstanding the unavoidable delays in collecting samples of the fruit, wood, and bark for illustration, the Inspector of Forests has made such good progress that I trust the first part of the "Forest Flora" will be ready for publication within this year, and I feel convinced that the work will reflect credit upon the Department.

Due attention has been given to the collection of dried flowering specimens and seeds of our timber trees for planting, distribution, &c., &c.

Information has been collected and disseminated concerning the known poisonous plants of New South Wales, and directions have been issued for the guidance of Rangers and others in collecting and preserving specimens of plants known or suspected to be poisonous to stock, with a view to their examination and arrangement for reference.

A collection of timber specimens has been prepared for exhibition in the Geological Museum attached to this Department, and it is intended to prepare for exhibition in connection therewith seeds and seed-vessels of these specimens, together with dried leaves and flowers of each species; also gums, resins, fibres, tanning and other barks, &c., &c.

I have, &c.,

HARRIE WOOD,

Under Secretary for Mines.

Department of Mines,
Sydney, May 11th, 1886.

Report from The Chief Clerk, Forest Conservatory Branch, to The Under Secretary for Mines.

Sir, Forest Conservatory Branch, Sydney, 31 March, 1886.

I have the honor to submit a report for the year 1885 upon the work performed by this Branch of the Department.

The Staff.

Schedule A shows the number of officers and others employed, during the year, the only change in the *personnel* of the Staff has been the appointment of Mr. Forest Ranger Powell, *vice* Mr. West, transferred to the Department of Lands.

In schedule B a list of the Forest Rangers in the field is furnished, together with the names of stations and the Land Districts within which they exercise supervision.

With reference to the duty performed, it may be remarked that while in some districts the Rangers are employed in patrolling timber reserves, supervising timber cutting, and similar work, in other districts they are almost wholly engaged in inspecting country in connection with reporting upon applications to ringbark the timber, and in seeing that the conditions of the permissions granted are carried out.

Revenue and Expenditure.

The following schedules are supplied :—

C. Revenue for the year 1885.
D. Expenditure „ „
E. Details of revenue from specified reserves.
F. Comparative statement of revenue and expenditure for each year, from 1878 to 1885.
G. Prosecutions by Forest Rangers for illegally cutting timber; penalties inflicted.

The revenue has not reached the estimate. This is partly attributable to the lessened demand for our timber in Victoria, the railways in that Colony having opened up sources of supply hitherto inaccessible ; partly to the completion of certain public works, the timber for which was drawn from the protected forests, and partly to the effects of the drought. The fall in the value of wool and consequently lessened expenditure, and the uncertainty regarding the subdivision of runs, has no doubt also contributed to the falling off.

In 1884, 9,084,779 sup. feet, exclusive of piles, were cut on the Murray Forests, while in 1885 the quantity reached only 3,975,796 sup. feet. In 1884 the exports to Victoria were 11,259,420 feet against an import of 2,143,476, the figures for 1885 being 6,765,675 and 2,302,739 respectively.

The duty of reporting upon applications for permission to ringbark timber upon Crown lands is again accountable for a large proportion of the expenditure.

Reserves and Timber.

The following schedules are appended :—

H. Summary of number and area of Timber Reserves.
J. Distribution of Timber Reserves amongst Forest Rangers for purposes of supervision.
K. Details of area and particulars of timber on reserves notified during the year.
L. Reserves cancelled wholly or in part.
M. Reserves exempted under Regulations existing prior to 2nd July, 1885, the timber upon which is subject to royalty.
N. Lands other than timber reserves exempted from operation of ordinary timber or wood-cutters' licenses.

The reserves for preservation of timber supply number 855, the aggregate area being estimated at 5,675,950 acres. This is an apparent increase of 285,432 acres. In a large number of cases, however, reserves, after careful inspection, have been recommended to be cancelled or curtailed, so as to cut out portions found not to contain useful or valuable timber. These recommendations are now being acted upon by the Lands Department, and will have the effect of considerably reducing the total area. The operation of the 52nd section of the Crown Lands Act will have the effect of still further reducing it.

On the reserves subject to royalty, the quantity of timber cut amounted to 6,860,512 superficial feet, besides 828 trees. On a very large number of the reserves the timber is subject to a license fee only, and no account of the quantity felled is taken. On all timber reserves a minimum girth is fixed, below which trees are not permitted to be felled without special permission.

The quantity of timber returned by the Forest Rangers as shipped from twenty-nine coastal ports is :—

Sawn timber, hardwood, and cedar	57,418,631	sup. feet.
Hardwood piles, girders, and logs	3,219,679	„
Cedar, in log	1,731,000	„
Paving blocks	300,000	„
	62,669,310	„
Piles	2,350	running feet.
Do	2,260	number of
Sleepers	31,407	„
Posts and rails	185,600	„
Palings	523,402	„
Spokes	86,283	„
Felloes	60,000	„
Dray-shafts	546	„
Laths	2,315,900	„

This is exclusive of Sydney and Newcastle, which are ports of reshipment.

The

The ruling rates for Colonial timbers are at present low, the following being the quotations in Sydney:—

Cedar boards, 18s. to 35s. per 100 sup. feet.
„ logs, 16s. to 25s. „ „ girth measurement.
Pine (coast) boards, 12s. to 16s. per 100 sup. feet.
„ logs, 7s. to 9s. „ „ girth measurement.
Beech „ 14s. to 18s. „ „ „
Ironbark (sawn), 14s. „ „
Assorted hardwoods (sawn), 7s. to 10s. per 100 sup. feet.
„ (logs), 5s. 6d. to 6s. „ „ girth measurement.
Girders (ironbark), up to 2s. per cubic foot.
Piles—ironbark, turpentine, grey gum, red gum—price according to length.

Assorted hardwoods are stated to include stringybark, tallow-wood, turpentine, spotted gum, blackbutt, and woolly-butt. It is, however, reported that other kinds of wood, of similar appearance to some of these, are often sold under the above names.

The supply of most descriptions of felled timber is apparently largely in excess of the demand, hence the comparatively low prices and the closing of several mills, present rates not proving remunerative.

In the western districts the principal timbers used for saw-mill purposes are pine (*frenela*), ironbark, red gum, and stringybark. Prices vary according to the locality. The pine (*frenela*) though rather brittle, from its resisting the white ant (*termite*), is a most valuable wood, and in some localities commands a higher price than American timber, at Tumut the prices being 26s. and 22s. 6d. respectively. Matured, or even fairly grown trees, are becoming scarce in some districts, and the right to cut over limited areas commands a high rate.

Much of the country bordering the Murray, Darling and Lower Murrumbidgee Rivers is supplied with red gum from the Murray Forests, the river affording unusual facilities for access to these valuable national forests. The timber is drawn a few miles to the river bank when the ground is sound. If this cannot be done it is allowed to lie until the forest is flooded with the water from the melting snow on the mountains. The logs are then fished up and punted to the river, where they are slung to ends of beams lying across barges. The barges, with their suspended loads, are then either towed up to the mill or allowed to drift down, a chain trailing loose from the stern having the effect of keeping them in mid-stream away from the banks. Local quotations for sawn timber are 10s. to 14s. per 100 sup. feet. A large quantity of the timber is used for piles, girders, railway sleepers, &c.

The hardwoods, from their weight, would probably form fair ballast, and, if charges did not exceed 20s. per ton, most kinds could be landed in London at from 10s. to 12s. per 100 sup. feet. At present rates this would be likely to prove remunerative, as the timber has a high value for many purposes.

Thinning out Timber on Reserves.

During the year permission has been granted to thin out, under special supervision, useless timber and scrub on three timber reserves of a total area of 18,780 acres. Of this area 3,260 acres have been operated upon. Work in progress at the commencement of the year on five reserves has also been completed to the extent of 11,430 acres.

Ringbarking.

Permission to ringbark timber, on lands other than timber reserves or State Forests, is now granted by the Local Land Boards, under such restrictions as may to them seem advisable. The Forest Rangers report upon applications sent to them by the Chairman, and the reports are returned direct. No instructions as to timber to be excepted, &c., are now issued by this Department for their guidance.

It may be stated that the preparation of specific instructions affecting such a subject is a very difficult matter, the circumstances vary so widely in different parts of the Colony; but the utility of one general rule formerly insisted upon, viz., the leaving belts of timber untouched at intervals in the Western Districts, or where scrub is troublesome permitting only pine to be ringbarked in such belts, was exemplified on a recent journey to the country. Land, formerly scrubby and thickly wooded, had been alienated and the timber ringbarked for some years. The dropping wet season prevailing in the locality at end of the year induced an extraordinary growth of grass, far beyond what anyone viewing the land in its natural state would suppose could be possible. This grass caught fire and there being no break of timber the fire got beyond control. Some 60,000 or 70,000 acres were burnt, including several selections.

Cedar, Catalpa, and Wattle Plantations.

The amounts expended on plantations, &c., is given in Schedule D, particulars of the work done will be furnished by the Inspector of Forests under whose directions it is carried out.

Indian and Colonial Exhibition.

A large amount of work was done by the Forest Rangers toward making a collection of the timbers, leaves, flowers, and seeds of timber trees for the Indian and Colonial Exhibition.

Office.

The following papers were received and despatched:—

Papers received and registered.	Papers despatched.
10,829, exclusive of 944 timber license returns.	Letters, manuscript, 3,270. „ on printed forms, 3,592. Blank-cover communications, 1,169.

I have, &c.,
W. F. PIPER,
Chief Clerk.

SCHEDULE A.

SCHEDULE A.

OFFICERS and others employed in 1885.

Office.	Number.	Salaries. £ s. d.
Chief Clerk	1	320 0 0
Clerks	8	1,390 0 0
Inspector of Forests	1	370 0 0
Forest Rangers	28	5,785 0 0
Assistant Rangers	11	1,725 0 0
Acting Rangers, Lord Howe Island	2	60 0 0
„ Silverton	1	15 0 0
Messenger	1	100 0 0
Engineer, launch "Neptune"	1	120 0 0
Wood-cutter „ „	1	91 5 0
Caretaker of Reserves	1	.....
Total	56	9,976 5 0

SCHEDULE B.

LIST of Forest Rangers, together with the names of Stations and of Land Districts over which they exercise supervision.

Name of Ranger.	Station.	Land District supervised.
Allan, J. S.	Ulladulla	Braidwood, Broulee, Dowling, Shoalhaven (Nowra).
Allen, W.	Wagga Wagga	Portion of Gundagai and Wagga Wagga Districts lying north of Murrumbidgee River.
Brown, G. R.	Mudgee	Cassilis, Mudgee, Rylstone, Wellington.
Croberoft, E.	Gosford	Brisbane Water, Newcastle, Wollombi.
Brunker, F. E., Assistant	Coorambong	
Condell, J. G.	Narrandera	Narrandera, Urana, Eastern part of Hay.
Musgrave T., Assistant	Urana	
Cullen, P.	Booral	Dungog, Port Stephens (Stroud), Raymond Terrace.
Deverell, E. J.	Glen Innes	Bingera, Glen Innes, Inverell, Moree, Tenterfield, Warialda.
Byron W., Assistant	Inverell	
Evans, T. M.	Queanbeyan	Goulburn, Gunning, Queanbeyan, Yass.
Green, T. H.	Casino	Casino.
Higgens, E.	Muswellbrook	Maitland, Muswellbrook and Merton, Patterson, Patrick's Plains (Singleton), Scone.
Huxham, F. P.	Grafton	Grafton (the south-eastern portion, including Dorrigo Reserve, No. 377, and Orara Reserve, No. 642, are supervised by the Boat Harbour Ranger, W. Mecham).
Forster, F. M. C., Assistant		
Kidston, T.	Condobolin	Condobolin, south-eastern part of Cobar, north-west part of Parkes, eastern part of Hillston.
Macdonald W., Assistant Ranger	Worrel Creek	Macleay River (West Kempsey), that portion south of Taylor's Arm and the northern boundary of the county of Dudley.
	Nambucca	
M'Gee, T. H. B.	Narrabri	Coonabarabran, Coonamble, Narrabri.
King G., Assistant	Coonamble	
Manton, J. A.	Moama	Moama, southern portion of Deniliquin. Ranger Manton has also general supervision of Ranger Payten's (Tocumwall), and Wilshire's (Deniliquin) Districts, which see.
Guilfoyle, J.		
Cousens, W., Assistant	Koondrook	
Martin J.	Dubbo	Dubbo.
Mecham, W.	Boat Harbour	Macleay River (West Kempsey), that portion north of Taylor's Arm, and the north boundary of the county of Dudley; also reserves Nos. 377 and 642.
Noake, I.	Penrith	Hartley, Windsor, but excepting the county of Cumberland.
Payten, S.	Tocumwall	Corowa.
Powell, H. W.	Gunnedah	Gunnedah, Tamworth, Murrurundi.
Rotton, H. O.	Bowral	Berrima, Camden, Narrellan, Kiama, Picton, Wollongong.
Shadforth, H. S.	Candelo	Bega, Bombala, Cooma, Eden.
Siddens, R. L.	Armidale	Armidale, Walcha.
Stevenson, R.	Cowra	Bathurst, Boorowa, Carcoar, Cootamundra, Cowra, Forbes, Grenfell, Molong, Orange, Young, south-eastern portion of Parkes.
Cork, R. J.	Forbes	
Postlewaite, J. G.	Grenfell	
Assistants		
Taylor, J. S.	Wagga Wagga	Albury, Tumut, portion of Gundagai and Wagga Wagga Districts lying south of Murrumbidgee River.
Ward J., Assistant	Adelong	
White, T.	Lismore	Lismore, Tweed River (Murwillumbah).
Wilshire, O.	Deniliquin	Deniliquin, portions of Balranald and Hay Districts in counties of Townsend and Wakool.
Wilson, T. W.	Port Macquarie	Manning River (Wingham), Port Macquarie.

SCHEDULE C.

PARTICULARS of Revenue—Year ending 31st December, 1885.

	£ s. d.	£ s. d.
Reserves exempted by proclamation from ordinary timber licenses—		
State forest block licenses	1,041 6 10	
Sub-licenses	43 0 0	
Forest—26th and 27th Regulations of 24th September, 1878, and Permit Class C, of 18th August, 1885	129 0 0	
Permit without royalty—timber cutters, Class A	638 15 0	
Miscellaneous	34 0 0	
		1,886 1 10

Royalty—

SCHEDULE C—*continued.*

Royalty—			
At per 100 superficial feet, cut under block license	1,895 11 0		
„ tree, cut under 26th Regulation of 24th September, 1878, and 44th Regulation of 18th August, 1885	189 14 6		
„ 100 superficial feet cut under 27th Regulation of 24th September, 1878, and 16th Regulation 18th August, 1885	1,256 0 4		
		3,341 5 10	
Crown lands and reserves not exempted from the operation of ordinary licenses—			
*Hardwood and bark	2,386 0 0		
Woodcutters	3,115 15 0		
General	1,263 15 0		
Cedar cutters	572 0 0		
		7,337 10 0	
Seizures of timber—proceeds of sale	539 17 6		
		539 17 6	
Ringbarking inspection fees	39 2 6		
		39 2 6	
Total		£13,143 17 8*	

* Note.—Licenses to quarry stone, &c., issued in addition to the above during the year, £719 8s.

SCHEDULE D.

Expenditure, 1885.

Particulars of Service.	Amount.
	£ s. d.
Salaries	9,390 0 0
Travelling and contingent expenses, including salaries or wages of temporary employees	7,643 4 9
Indian and Colonial Exhibition	171 6 0
Wattle-planting	69 12 0
Catalpa	371 16 2
Cedar	389 17 1
Forest Flora	110 1 6
Total	£18,145 17 6

SCHEDULE E.

Revenue from Exempted Reserves, year 1885.

County.	Reserves.	Quantity.	License Fee.	Royalty.	Total.	Description of Timber.
		Royalty, at per 100 superficial feet.				
		Super. ft.	£ s. d.	£ s. d.	£ s. d.	
Bland	Weddin	92,286	9 0 0	40 13 0	49 13 0	Pine, ironbark, red gum.
Bourke	Coolaman	655,271	15 0 0	228 6 4	243 6 4	Pine.
„	Matong	.....	33 0 0	.....	33 0 0	
„	No. 2,652	679,594	5 10 0	201 11 11	207 1 11	Pine.
Cadell	Moama	963,010	127 10 0	481 10 0	609 0 0	Red gum.
Camden	Cordeaux	199,269	92 7 6	50 11 3	142 18 9	Blackbutt, bloodwood, mountain ash, stringybark, turpentine.
Clarence	Clarenza	109,632	30 0 0	27 8 3	57 8 3	Spotted gum, box.
Cumberland	No. 110	208,750	4 10 0	69 11 8	74 1 8	Ironbark, blackbutt, turpentine, bangally.
Fitzroy	Cloud's Creek	3,525	4 10 0	1 15 3	6 5 3	Cedar.
„	Dorrigo	198,575	47 10 0	99 5 9	146 15 9	„
„	Orara	115,431	36 10 0	86 14 6	123 4 6	„
Mitchell	Gillenbah	54,200	1 10 0	27 15 9	29 5 9	Pine.
Northumberland	No. 129	41,925	41 15 0	20 19 3	62 14 3	Ironbark.
Pottinger	No. 1,665	26,551	3 0 0	6 12 9	9 12 9	Pine.
Richmond	Tatham	123,537	2 10 0	61 9 10	63 19 10	Ironbark, red gum, beech, teak, grey gum, clagiru.
Rous	Pimlico Island	42,000	6 0 0	26 5 0	32 5 0	Pine.
„	Tweed River	.....	1 0 0	.....	1 0 0	
Selwyn & Wynyard	Bago	18,665	3 0 0	4 13 4	7 13 4	Mountain ash.
Sturt	Wowong	.....	13 0 0	.....	13 0 0	
St. Vincent	Tomago	.....	47 0 0	.....	47 0 0	
Townsend	Gulpa Island	196,660	106 0 0	130 4 0	236 4 0	Red gum, pine.
„	Millewa	618,312	282 10 0	336 14 1	619 4 1	„
„	Moira	859,548	57 0 0	430 5 4	487 5 4	„
Urana	Brookong	2,200	0 10 0	0 14 8	1 4 8	Pine.
„	Osborne	119,800	12 0 0	47 14 0	59 14 0	„
„	No. 3,052	34,600	2 0 0	17 6 0	19 6 0	„
„	No. 2,613	88,900	1 10 0	26 15 2	28 5 2	„
Wakool	Campbell's Island	333,408	25 16 4	166 14 0	192 10 4	Red gum.
„	Koondrook, No. 1	974,495	194 18 0	537 9 0	732 7 0	„
„	Neimur	30,368	2 10 0	5 1 3	7 11 3	„
	Sundry Village Reserves.	70,000	3 10 0	17 10 0	21 0 0	Hardwood, spotted gum.
		6,860,512	1,212 6 10	3,151 11 4	4,363 18 2	

SCHEDULE E—*continued.*

County.	Reserve.	Quantity.	License Fee.	Royalty.	Total.	Description of Timber.
		Royalty, at per tree.				
		No. of trees.	£ s. d.	£ s. d.	£ s. d.	
Auckland	Myrtle Creek	7	1 0 0	0 17 6	1 17 6	Messmate, mountain ash.
Cadell	Moama	31		14 16 0	14 16 0	Box, red gum.
Cumberland	No. 93	99		24 1 0	24 1 0	Blackbutt, turpentine, bangally, ironbark.
Denison	No. 1,592	507		45 5 0	45 5 0	Pine.
Fitzroy	Dorrigo	1		1 10 0	1 10 0	Cedar.
Rous	Terania Creek	9		1 10 0	1 10 0	Tallow-wood, bloodwood, ironbark, white gum.
St. Vincent	Monga	4		1 0 0	1 0 0	Messmate.
Townsend	Gulpa Island	122		94 0 0	94 0 0	Red gum.
Wakool	Koondrook, No. 1	42		5 5 0	5 5 0	Pine.
	Sundry Village Reserves.	6		1 10 0	1 10 0	Box, blackbutt, tallow-wood.
		828	1 0 0	189 14 6	190 14 6	
		Without Royalty				
	Myall and Wallis Lakes and Forster Permit, Class A.		638 15 0		638 15 0	
	Miscellaneous		34 0 0		34 0 0	
			672 15 0		672 15 0	
				Totals—License fees	1,886 1 10	
				Royalty	3,341 5 10	
				£	5,227 7 8	

SCHEDULE F.

STATEMENT of Revenue and Expenditure for each Year, from 1877.

Year.	Revenue.		Expenditure.
	Forest Conservancy.	Forest Conservancy and Quarry Licenses.	
	£ s. d.	£ s. d.	£ s. d.
1877		4,324 10 3	4,579 7 6
1878		5,934 14 0	5,592 12 6
1879	7,309 18 2	7,945 18 2	5,920 2 11
1880	8,328 4 3	8,990 4 3	6,635 10 10
1881	10,155 13 8	10,812 13 8	7,093 4 11
1882	12,326 18 10	13,046 18 10	12,591 19 5
1883	16,000 19 7	16,685 19 7	15,389 15 11
1884	17,565 5 8	18,250 5 8	17,480 14 5
1885	13,143 17 8	13,863 2 8	18,145 17 6

SCHEDULE G.

PROSECUTIONS undertaken by Forest Rangers.

Offence.	Number of Prosecutions.	Number of Convictions.	Amount of Penalty.
			£ s. d.
Illegally cutting and removing timber	124	97	96 3 8
Quarrying or removing other materials	10	1	0 5 10
Trespass on Crown Lands	11	5	1 3 6
	*144	103	97 13 0

*Exclusive of prosecutions by other Crown Lands Bailiffs.

Number of cases in which timber or other material has been seized 100
Number of cases in which claims have been preferred to seized material 49
Number of cases in which claims have been confirmed 37

SCHEDULE H.

SUMMARY of Timber Reserves.

		No. of Reserves.	Area in Acres.
Reserves, Class A.	Regulations 10 to 12	591	3,269,103½
,, ,, B.	,, 13 to 15	2	24,440
,, ,, C.	,, 16 to 21	258	2,363,656½
State Forests	,, 22 to 25	4	18,750
		855	5,675,950

SCHEDULE J.

SCHEDULE showing area and number of Reserves under supervision of the Forest Rangers.

Locality.	Forest Ranger.	No. of Reserves.	Area in Acres.
Richmond and Tweed Rivers	T. White, Lismore	63	194,712
Upper Richmond	T. H. Green, Casino	25	281,411
Clarence	F. P. Huxham, Grafton; Assistant Ranger, F. M. C. Forster, Grafton.	34	181,806
Nambucca and Bellinger Rivers	W. Mecham, Boat Harbour; Assistant Ranger, W. M'Donald, Kempsey.	12	293,214
Northern New England and Gwydir	E. J. Deverell, Glen Innes; Assistant Ranger, W. Byron, Inverell.	51	266,717¼
Gunnedah and Tamworth	H. W. Powell, Gunnedah	16	143,567
Armidale and Walcha	R. L. Suldins, Armidale	53	254,806
Port Macquarie	T. W. Wilson, Port Macquarie	12	79,391
Myall and Gloucester River	P. Cullen, Booral	3	25,154
Hunter River	E. Higgins, Muswellbrook	13	89,885¼
Mudgee and Cassilis	G. R. Brown, Mudgee	18	59,958½
Dubbo	J. Martin, Dubbo	20	235,447
Condobolin	T. Kidston, Condobolin	23	153,499
Upper Lachlan	R. Stevenson, Cowra; Assistant Rangers, R. Cork, Forbes; J. G. Postlethwaite, Grenfell	74	311,865¼
Penrith and Hartley	I. Noake, Penrith, (J. Wilson, caretaker of three reserves)	10	105,069
Namoi	T. H. B. M'Gee, Narrabri; Assistant Ranger, G. King, Coonamble.	44	815,678
Brisbane Water and Wollombi	E. Cobcroft, Gosford; Assistant Ranger, F. E. Brunker, Cooranbong.	10	80,976
Mittagong and Camden	H. O. Rotton, Bowral	27	48,099⅞
South Coast and Monaro	H. S. Shadforth, Candelo	75	118,166½
Queanbeyan and Goulburn	T. M. Evans, Queanbeyan	15	71,265
North Wagga Wagga and Gundagai	W. Allen, Wagga Wagga	19	225,309
South Wagga Wagga, Albury, and Tumberumbah.	J. S. Taylor, Wagga Wagga; Assistant Ranger, J. Ward, Adelong.	41	380,624¾
Narrandera and Urana	J. G. Condell, Narrandera; Assistant Ranger, T. Musgrave, Urana.	71	244,220½
Murray, Edward, and Wakool Rivers	J. A. Manton, Moama; Assisted by Rangers, O. Wilshire, Deniliquin; S. Payten, Tocumwal; J. Guilfoyle, Moama; and Assistant Ranger, W. Cousins, Koondrook.	72	461,335½
Shoalhaven and South Coast	J. S. Allan, Ulladulla	34	494,866
Cumberland	J. M'Keown, Petersham, Cumberland Ranger	1	106
	Not under special supervision	19	58,800½
		855	5,675,950¾

SCHEDULE K.

TIMBER RESERVES notified during the year 1885.

County.	Number and Name.	Area in Acres.	Names of principal kinds of Timber.	Report and General Remarks.
Townsend	2	429¼		
Do	3	444¾		
Do	7	954		
Urana	1,799—Extension	335	Pine	Thickly covered with good timber in all stages of growth.
Do	3,052A—Extension	3,820	Pine and box	Thickly timbered.
Vernon	1	6,700		
Westmoreland	36—N. Extension	270	Stringybark, ironbark, gum, and box.	
Do	100	2,300	Blackbutt, gum, peppermint, mountain ash, hickory, stringybark	Fairly timbered.
Do	101	62,000		
Warradgery	2	13,000		This reserve includes the Hay common.
Wakool	1,789—Extension	80	Red gum	
Richmond	13	2,800		
Do	14	1,500		
Do	15	4,200		
St. Vincent	103—Extension	640	Hardwood	Heavily timbered.
Do	166	14,720	Mountain gum, white-top messmate, woollybutt, mountain ash	Heavily timbered.
Tandora	1	720		
Do	2	368		
Yancowinna	4	960		
Do	5	10,240		
Do	6	10,240		
Do	7	2,560		
Do	8	1,444		
Do	9	1,568		
Monteagle	6	680		
Do	13	200	Stringybark and pine.	Fair quality.
Menindie	1	1,900		
Mitchell	2,722—Extension	1,400	Pine, box, and bull oak	
Phillip	165	6,500		
Do	168	800		
Rous	3	20		
Do	16	896		

SCHEDULE K—*continued.*

County.	Number and Name.	Area in Acres.	Name of principal kinds of Timber.	Report and General Remarks.
Richmond	9	2,300		
Do	10	1,100		
Do	11	2,800		
Do	12	4,800		
Gordon	3	750		
Gipps	4	7,670		
Do	1,875A	2,901	Pine, belah, ironbark, and box	Fairly timbered.
Harden	1	1,015	Stringybark, messmate, white gum, and yellow box.	
Hardinge	3	3,000	Stringybark, messmate, woollybutt, gum, box, apple, and peppermint.	Quality good.
Jamieson	4	3,000	Belar	Suitable for fencing purposes.
Do	6	2,100		
Kennedy	4	8,480		
Lincoln	7	42		
Leichhardt	17	3,200		
Do	21	1,700	Pine and box	Healthy growth, of fair quality.
Do	22	1,500	Pine	Good quality.
Dampier	307—Wagonga Extension.	4,200	Spotted gum, blackbutt, stringybark, messmate, ironbark, peppermint, box, and red gum.	Thickly covered with good timber, in all stages of growth.
Fitzroy	28	640	Young cedar and hardwoods.	This reserve is, in effect, an extension to the Dorrigo timber reserve.
Do	31	4,680		
Forbes	1350A—Extension	30	Pine and box	
Farnell	1	1,100		
Finch	4	1,920	Pine	Fair quality.
Do	8	5,500	Pine and carbeen	
Durham	201	22,400	Hardwood and cedar	Quality good.
Do	202	48,000	do	do.
Flinders and Kennedy	4	3,360		
Do	5	15,360		
Bland	6	75	Pine	
Clive	2	3,000	Stringybark, messmate, woollybutt, &c.	Thickly timbered.
Do	3	2,560	do do	do.
Cooper	1	11,700	Black and white pine and box	Pine good; box inferior.
Clarence	24	2,500		
Do	25	1,900		
Do	26	1,280		
Clarence and Richmond	27	3,520		
Courallie	4	50		
Dampier	2—Amhurst Island	25		Reserved for ornamental purposes.
Do	4	3,800	Mountain ash, sassafras, messmate, white gum, coachwood, ribbon gum.	Fairly timbered; also notified for trigonometrical purposes.
Do	16	5,700	Ironbark, peppermint, stringybark, blackbutt, bloodwood, box, and redwood.	Generally of good quality.
Ashburnham	4	4,000	Pine, ironbark, and stringybark	Good quality.
Auckland	1	720		
Do	15	60		
Do	16	536		
Do	17	4,000		
Do	337—Extension	635	Black ash, messmate, white gum, and stringybark.	Fairly timbered; medium quality.
Beresford	622—Extension to	50	White gum, peppermint, and box	
Bourke	1	640	Pine	
Do	2,652—Extension to	473	Pine	
Do	2,786A	4,530	Ironbark, box, and pine	
Boyd	1,905—Extension to	87	Red gum	
Baradine	9	8,320	Ironbark	Fair quality.

SCHEDULE L (A).

SCHEDULE of Reserves cancelled.

Number.	County.	Area in Acres.	Remarks.
1,657	Baradine	17,920	No. 9 notified in lieu.
2,786	Bourke	4,550	„ 2,786A „ „
3,079	Bland	154	„ 6 „ „
746	Finch	3,360	„ 4 „ partly in lieu.
1,875	Gipps	3,000	„ 1,875A „ in lieu.
636	Hardinge	500	
1,873	Jamieson	2,750	„ 3 „ „
1,883	„	160	
219	Macquarie	14	
220	„	27	
221	„	80	
630	Lincoln	4,480	
1,849	Townsend	930	
122	St. Vincent	13,000	

SCHEDULE L (B).

SCHEDULE of Timber Reserves partly cancelled.

Number.	County.	Area cancelled.	Remarks.
		Acres.	
1,794	Cadell	304	
3,177	Buccleuch	100	
307	Dampier	4,200	307 west extension notified in lieu.
1,120	Drake	12	
355	Fitzroy	200	
1,350A	Forbes	30	
30	Phillip	5	
106	"	647½	
64	Roxbrough	300	
1,174	Rous	40	
1,890	Mitchell	320	Part of extension.
249	Rous	1,600	
60	Roxbrough	4½	
633	Robinson	40	
103	St. Vincent	42	
103	"	13,500	
103	"	12	
103	"	40	
45	"	9,550	
103	"	80	
1,354	Vernon	240	
1,787	Wakool	8	
1,789	"	102	
1,789	"	51	
3,258	"	600	
3,258	"	9	

SCHEDULE M.

FOREST RESERVES proclaimed as exempted from the operation of the ordinary Timber Licenses issued under the Timber Regulations of 24th September, 1878.

Timber cut upon these Reserves is subject to license fees, payment of royalty, and the conditions specified in the State Forest Regulations, or in the Regulations applying to the Timber Reserves, Class C.

County.	Parish.	No. of Reserve	Area in Acres.	County.	Parish.	No. of Reserve	Area in Acres.
Ashburnham	Waugan	2030	190	Cadell	Perricoota	3255	810
Auckland	Cobra and Yuramine	337	1960	Camden	Wollongong	38A	580
Auckland and Wellesley.	Mila, Lawson, Gulgin, & Bondi	385	1440	Do	Burrawang	43A	59
Auckland	Werriberri	991	1000	Do	Wonona, Dendrobium, and Cordeaux (that part exempted by notice of 21st October, 1881).	57	24500
Do	Mumbulla, Bega, and Brogo	996	350				
Do	Mumbulla	1003	3000				
Baradine and White.	Belmore, Coghill, Cook, Cap, Mollee Gowie, Bohena, Quinn, Boral Merrimborough, Anson, Dampier, and Newable.	1273	151400	Do	Jamberoo and Kiama	78	202
				Do	Jamberoo	112	200
				Do	Wallaya	119	4840
				Do	Bunberra	120A	150
				Do	do	121A	120
Bathurst	Tintern	184	2923	Do	Broughton and Wallaya	122	440
Benarba	Banarway	814	2500	Do	Burrawang and Yarrawa	154	1700
Beresford	Murrimbucka	266	960	Do	Broughton	155	15
Do	Bulgundramine	287	2500	Do	do	156	52
Do	Gladstone	438A	20½	Do	do	157	60
Bland & Harden	Congon and Jindalee	1274	3260	Do	Broughton and Wallaya	168	2968
Bland & Monteagle.	Euroka, Marowie, Bimbi, and Weddin.	1855	34560	Do	Cambewarra	173	100
				Do	Bunberra and Cambewarra	174	350
Bligh	Warung and Gunna	142	1070	Do	Jamberoo and Kangaloon	175	1600
Do	Warung	143	2150	Do	Cambewarra	209	1000
Bligh, Pottinger, & Napier.	Brennan, &c.	646	6720	Do	do	231	370
				Cook	Irvine	33	160
Bourke	Gunnain	303A	1920	Do	do	201	61
Do	Coolaman and Kindra (that part notified 25th January, 1876).	892	34675	Do	do	202	28
				Clarke	Big Hill, George, Clarke, Geogla, Styx, Serpentine, and Cunnawarra.	1662	45000
Bourke	Hooke, Gunnain, and Kockibertoo (that part notified 22nd August, 1877).	1251	9246	Do	Snowy and Serpentine	1663	17000
				Clarence	24 Islands in Clarence River	38	1184
Do	Elliott, Kockibertoo, & Matong	1421	13280	Do	Banyabba, Richmond, and Lawrence.	242	16000
Do	Robertson	1439	25655				
Do	Ashbridge, Dulah, and Devlin	2652	62000	Do	Tyndale, Cunoulum, and Coldstream.	243	16000
Brisbane	Watt and Campbell	95A	3602¾				
Boyd	Uri	180	1400	Do	Glen Ugie	244A	8320
Do	Cararbury	182	1280	Do	Chapman	245A	12800
Do	Colcambally	1731	1566	Do	Great Marlow	260	71
Do	Argoon	1754	1692½	Do	Southgate	353	4480
Do	Mygotha	1755	640	Do	Woodford	394	20
Do	do	1756	10524	Do	Elland and Lanitza	406A	3921
Do	do	1757	538	Cumberland	Gordon	97	106
Do	Eunanbrennan	1884	937	Do	Bulgo and Heathcote	110	5742
Do	Cararbury	1905	2240	Courallie	Weebullabulla, Menandool, and Bundawithidie.	948	800
Do	Waddi	1997	1207½				
Do	do	2258	1200	Do	Carore	1059	2700
Buccleuch	Adjunbilly and Wyangle	3177	14000	Cooper	Grong Grong	310	2240
Cadell	Moama and Bama	3252	6500	Do	Binga, Binya, and Stanbridge.	2740A	30000
Do	Bama, Gulpa, and Moira	3253	37000	Do	Coolaragang and Cuba	2984	1020
Do	Toorangabby, Tomara, Burrumburry, Tantonan, & Thule.	3254	51200	Do	Cuba and Hulong	2985	5098
				Do	Dallas	2986	300

SCHEDULE M—*continued.*

County.	Parish.	No. of Reserve	Area in Acres.
Cooper	allas, Cogeldrie, and Yarrangery.	2987	6560
Do	Yarrangery	2988	3820
Do	Coolaragang	2992	880
Do	Dallas	2993	2200
Do	Barralong	3037	3200
Clarendon and Harden.	Burra, Muttama, Mitta Mitta, and Ullandra.	2284	1920
Dampier	Bodalla (that part notified 27th July, 1875).	249	380
Do	Wagonga	307	3800
Drake	Fairfield and Timbarra	248	31360
Do	Mookimer and Rodham	537	38400
Drake and Richmond.	Pickapene, Alice, Coongbar, Wyon, and Busby.	379	10365
Denison	Cottadidda	107	270
Do	Wahgunya	1591	4120
Do	Warmatta	1592	640
Do	Boomanoomana	1639	400
Do	Dry Forest (that part notified 29th December, 1876).	1656A	560
Do	Turramia	2386	420
Do	Warmatta	3144	740
Do	Mulwala and Turramia	3208	1340
Do	Boomanoomana	3209	960
Do	do	3210	2100
Do	do	3211	108
Do	Cottadidda	3212	300
Do	do	3213	280
Do	do	3214	150
Do	Barooga	3215	2500
Do	Mulwala and Turramia	3216	4396¼
Do	Cottadidda	3240	105
Do	Tocumwal	3241	400
Do	Woperana	3242	360
Durham	Goorangoola	79	1184
Do	Dyrring and Broughton	195	1250
Do	Mount Royal and Liebeg	196	10000
Dudley	Cunnawarra, Comara, Lignum, Nulla Nulla, Peedee, and Moules.	158	80000
Ewenmar	Galargambone	1555	500
Do	Warrie	1556	1480
Ewenmar and Gregory.	Galargambone and Tailby (that part notified 6th August, 1883).	1138	1040
Fitzroy	Ermington	259	3200
Do	Moonpar, Cope, Wirrie, Jardine, and Herborn.	354	48000
Do	Tyringham and Dorrigo	355	5560
Do	Bellinger, Coff, Macleay, and Moonee.	642	16000
Fitzroy and Raleigh.	Allan-Water, Vautin, Allan, Raleigh, Lee, & Bostobrick.	377	52480
Forbes	Morongla	1143	5440
Do	Jemalong	1724	610
Gloucester	Terarce, Bachelor, Gooloongalook, Wang Wauk, and Curreeki.	29	217600
Do	Stockton	171	600
Gipps	Cadow	1175	1250
Do	Weelah and Yarnel	1287	3840
Do	Ina	1303	2757½
Do	Towyal	1436	345
Goulburn	Cookardinia and Jerra Jerra (that part notified 13th February, 1877).	1743	4160
Goulburn and Mitchell.	Jerra Jerra, Pulletop, and Maclean.	3017	9500
Gough	Yarraford (that part notified 15th September, 1884).	746	130
Gordon	Belmore, Strathorn, Greenbank, and Hyandra.	1096	38400
Gordon and Narromine.	Caloma and Belmore	1117	2880
Do	Dubbo, Whylandra, and Dungary.	1118	1790
Gowen	Eringanorin, Breelong, Biralbung, Mundar, Dilly, and Yalcogrin.	1690	35000
Gregory	Gandymingadel (that part notified 6th August, 1883).	1355	1920
(See Ewenmar and Gregory.)			
Gresham	Urania and Springbrook	1542	6400
Do	Urania, Springbrook & Barool.	1608	24960
Harden	Bowning and Woolgarlo	1561	3000
Harden and Monteagle.		2393	6496
(See Bland and Harden.)			
(See Clarendon and Harden.)			
Hardinge	Ashton	939	600
Hawes	Dewitt, Coff, and Woko	666	22314
Hume	Morebringer	1607	320
Do	Gordon	1714	2080
Do	Collendina	1788	270
Do	Collendina and Corowa	1854	720
Lincoln	Murrungundie, Bald Hill, and Yarrenderry.	629	18240
Do	Dubbo	1671	20
Do	do	1672	20
Do	Lincoln	1688	9920
Do	Lincoln, Breelong, Breelong South, and Balladoran.	1689	37630
Leichhardt	Moorambilla and Moolambong	923	6300
Do	Tooloon and Nelgowrie	1720	880
Mitchell	Cuddell, Gillenbah, Wood, and Corobimilla.	1890	13280
Do	Mundowy and Berry Jerry	3232	11200
Mitchell and Urana.	Waugh, Clyde, Wood, and Birrigo.	3053	8320
(See Goulburn and Mitchell.)			
Macquarie	Burrawan (that part notified 9th February, 1880).	33	4860
Do	Macquarie	232	26
Do	do	233	340
Do	Cairncross	234	610
Do	Queenslake and Burrowan. (Included within the Cowarra Forest Reserve No 33).	235	3840
(See Bland and Monteagle.)			
(See Gordon and Narromine.)			
(See Bligh, Pottinger, and Napier.)			
Northumberland	Corrabarce and Congewai	46	16000
Do	Congewai, Stowe, Olney, Dora, and Mandolong.	70	33146
Do	Mulbring and Teralba	69A	6400
Do	Ourinbah	129	6560
Do	Eglinton and Narara	128	1280
Pottinger	Doona (that part notified 25th January, 1876).	743	5120
Do	Curlewis	1027	2000
Do	Denison and Denison West, (that part notified 18th February, 1881).	1271	25960
Do	Nea, Clift, and Breeza (includes part of Water Reserve No. 523).	1665	19070
(See Bligh, Napier, and Pottinger).			
Phillip	Price and Botobolar	30	5115
Raleigh	Unkya	70	3200
(See Fitzroy and Raleigh).			
Richmond	Tatham	45A	640
Do	West Coraki and Ellangowan	625	5400
Do	Ellangowan and Darke	974	3700
(See Drake and Richmond).			
Rous	22 Islands in Tweed River and 6 in Richmond River.	38	2360
Do	North Lismore and Dunnoon	249	22660
Do	Nullum	250	22400
Do		251	56320
Do	North Casino (that part notified 15th September, 1881).	255	2560
Do	Terrania	256	396
Do	Cudgen	257	616
Do	Newribar	258	1280
Do	In Tweed River (Stott's Island)	335	350
St. Vincent	Currambene and Nowra (that part outside municipal boundaries of Shoalhaven).	33	4480
Do	Yerriyong, Gerrawangala, Booligah, and Dangera.	44	10880
Do	Farnham and Cudmirrah	45	14300
Do	Tomaga, Mullendaree, and Mogendoura.	99	6000
Do	Conjola	115	51
Selwyn & Wynyard.	Hillas, Bago, Selwyn, King, Buddong, Courabyra, and Yellowin (that part notified 17th November, 1884.)	1961	58000
Sturt	Bringagee, Wowong, and Benerambah.	2989	4200
Do	Benerambah	2990	600
Tara	Moorna	383	305
Townsend	Mundiwa	1404	1920
Do	Ronald	1458	3400
Do	Benangalite, Morago, and Kerranakoon.	1792	4549½
Do	Conargo	1849	930
Do	Palmer	1851	1280
Do	Dunkeld	1879	1080

SCHEDULE M—*continued.*

County.	Parish.	No. of Reserve.	Area in Acres.
Townsend	Moultaassie	1880	3840
Do	Edgar	1901	1941¾
Do	Campbell	1902	1239½
Do	Boyce and Nallam	3263	13500
Do	Derulaman	3264	4200
Do	Towool, Bullatella, Caronalla, Bungooka, Tawarra, Naratoolo, and Wonnue.	3265	68580
Townsend and Wakool.	Balpool, Yadabal, Werai, Colimo, and Tumudgery.	3262	38500
Urana	Yamma	1456	1920
Do	Broome	1648	320
Do	Butherwa	1695	4800
Do	Yanko South	1778	282¼
Do	do	1779	551¾
Do	do	1780	1256
Do	Morundah (that part notified 26th November, 1879).	1799	10080
Urana	Clyde and Morundah	1883	11630
Do	Yanko	1835	1075
Do	Widgiewa and Urana	2049	465¾
Do	Widgiewa	2103	40
Do	Palmer	2216	1500
Do	do	2217A	1760
Do	Osborne (that part notified 20th April, 1881).	2317	10216
Do	Clyde and Boree Creek	2613	7950
Do	Gunambil	3052A	1400
Do	Palmer	3105	3340
(See Mitchell and Urana).			
Wakool	Noorong, Gonn, Moorangatta, Belmore, and Cobwell (that part notified 12th October, 1875).	1445A	21982¾
Do	Winter	1454	1600
Do	Moorangatta, Toolmah, and Merran.	1786	5440
Do	Wetuppa and Cunninyeuk	1787	11952
Do	Nallam, Neimur, Wetuppa, Worobyan Towwereuk, Nearoongaroo, Wandaradget, Boyd, Nyan, Jimaringle, Barrabu, Balpool, Yadabal, Gynoug, and Chowar (that part notified 18th February, 1876).	1789	29496
Wakool	Yarren, Kyalite, Moolpa Liewa, &c. (that part notified 18th February, 1876).	1790	10835
Do	Mallee	1834	10
Do	Thelaka (that part notified 21st March, 1879).	2032	696
Do	Nunnagoyt	2066	6220
Do	Wetuppa	3103	5000
Do	Gonn, Nunnagoyt, Barham, Whymoul, Danberry, Cangan, and Tiltil.	3258	89391
Do	Gnuie	3259	1820
	Mellool	3260	2760
	do	3261	2240
(See Townsend and Wakool).			
Wallace	Wulwye	233	960
Do	The Peak (that part notified 16th May, 1877).	335	400
Warradgery	Ulonga	1823	½
Do	Mungadel, Hay, South Hay, and East Warradgery.	2	13000
Wellesley	Burrimbucco	282A	4000
Do	Cathcart	322	120
Do	Thoco and Wellsmore	343	640
Do	Ironmungy	356	200
Do	Ironmungy and Burnaby (that part notified 8th February, 1878).	366	658
Do	Gecar	411	420
Do	Bungarby and Peters	428	4500
Do	Merringo and Merriangaah	874	2350
(See Auckland and Wellesley).			
Westmoreland	Konangaroo and Genolan	22	15360
Do	Bindo	83	1520
Do	Vulcan, Mozart, and Balfour	90	7000
(See Baradine and White).			
Wynyard	Murraguldrie and Kilgowla	1705	14000
Do	Gregado, Woomahrigong	1871	1280
Do	Gregado	1872	640
Do	Livingstone (that part notified 25th January, 1878).	1873	1280
Do	Woomahrigong (that part notified 25th January, 1878).	1874	1920
Do	Bulalgee and Carabost (that part notified 31st March, 1884).	1918	22400

SCHEDULE N.

LANDS exempted from the operation of ordinary Timber or Wood-cutters' Licenses.

In addition to the lands specified in the 2nd Timber Regulation of 18th August, 1885, the following lands have been notified in the Government Gazette as being exempted from the operation of ordinary timber or wood-cutters' licenses.

County.	Parish.	Area in Acres.	Date of Gazette Notice.	Particulars of Land.
Clarence	Elland, Clarenza, and Southampton.		31 Mar., 1885	All Crown Lands within the population boundary of South Grafton.
Cumberland	Southerland*		24 Dec., 1877	All Crown reserves.
Do	Bulgo, Heathcote, & Southend		4 Mar., 1885	Crown Lands.
Do	Londonderry		29 Oct., 1877	All Crown Lands.
Do	Hunter's Hill and Field of Mars	6235	4 Nov., 1879	Field of Mars Common.
Do	Hunter's Hill*	170	22 Dec., 1879	Lunatic Asylum reserve.
Do	Bulgo and Heathcote	100	20 Apr., 1885	Railway reserve No. 93.
Gloucester	Wang Wauh, Kyle,† Gooloongolook, Curreeki, Telcraree, Bachelor, Wallengat, Forster, Topi, and Booloombayt.	217600	29 Sept., 1877	Myall and Wallis Lakes Forests. Gold-field reserve No. 29.
Do	Nerong and Willabah		12 Nov., 1885	All Crown Lands in the parish of Nerong and part of Willabah.
Macquarie	Torrens		2 June, „	Land within Port Macquarie population boundary.
Mossgiel and Waljeers			17 Nov. „	Part of the resumed area of Mossgiel holding.
Leichhardt	Euroka and Youendah	4700	8 Dec., 1884	
Pottinger	Dubleda	30	2 Oct., 1885	
Wynyard	Wagga Wagga	1000	19 Aug., 1884	Travelling stock reserve No. 3,027.
Young		1600	20 June, 1879	Part of Wilcannia population reserve (Census of 1871.)
			14 Oct., 1878	Lord Howe Island.

* Timber cutting prohibited. † Timber cut under Timber Cutters' License, Class A, Regulations 10 to 12.

APPENDIX.

Annual Progress Report for the year 1885.

Report of the Inspector of Forests to The Under Secretary for Mines.

Sir,

I have the honor to submit my Annual Progress Report upon the Forest Conservancy Branch of this Department for the year 1885.

I have, &c.,
JOHN DUFF.

Reserves inspected, reports submitted, and work performed during the year 1885.

January, 1885. The Catalpa and other trees planted in the Bank-street reserve, East Maitland, were re-tied and watered at a cost to the Department of £7 15s.

The Catalpa trees on this reserve have grown remarkably well, but about fifty of the black walnut trees have died owing to the hot dry weather in the summer of 1885. It is proposed to prune the trees, re-stake and tie them, and re-plant the vacant spaces in this plantation during the forthcoming winter or spring.

Collections of dried flowering specimens of eucalyptus and other genera, and seeds and seed-vessels of same were received from several of the Forest Rangers, and complete sets of these specimens and seeds, together with all available information respecting the dimensions, habitats, uses, general characteristics, and extent of distribution of each species, were prepared and forwarded to Baron von Mueller, K.C.M.G., F.R.S., Government Botanist, Melbourne, to assist him in illustrating and describing the trees of New South Wales in his "Eucalyptographia" and other publications on the Flora of Australasia.

It is proposed to continue collecting and forwarding dried specimens, seeds, and information, as above specified, to Baron Mueller, as time and other circumstances will permit, until as complete a collection as can be procured by the officers of the Forest Branch has been made and transmitted to the Baron, and duplicate sets of all timber-tree specimens will be retained in this Branch of the Department for reference, Baron Mueller having kindly volunteered to furnish this Department with the names of all timber-tree specimens forwarded to him, the identity of which may be doubtful or unknown to me.

January and February. Clearing off grass and thinning the wattle trees in the plantations between Minto to beyond Burradoo, on the Great Southern Railway Line, was continued during the months of January and February, and cost the Department the sum of £35 4s. for labour.

Prepared and forwarded an additional collection of dried eucalyptus specimens, received from the Forest Rangers, to Baron Mueller, and requested him to furnish me with a list of all New South Wales plants known or suspected to be poisonous to stock, the said list being required for the information of the Chief Inspector of Stock of this Department, with which request the Baron readily complied.

Directions were also prepared for the guidance of the various Inspectors of Stock throughout the Colony in collecting and preserving specimens of the plants of New South Wales, known or suspected to be poisonous to stock, with the view of ascertaining their identity and forming a collection of them for future reference.

March. Accompanied Mr. L.-Surveyor Dalgleish to Hogan's Brush, forest reserve No. 63, near Gosford, for the purpose of ascertaining the boundaries of that reserve, with the view of having 100 acres of the most suitable land on it surveyed for a State Forest Nursery; and Mr. Dalgleish fixed the position of the reserve, and instructed another surveyor to clear and mark the boundaries of the 100 acres for the nursery site.

Inserted advertisements in the *Maitland Mercury*, and posted notices at the Court-house, Gosford, and at Wyong, calling for tenders for the clearing and fencing of the land proposed as a nursery site, and left specifications for the work to be done with Mr. Forest Ranger Coberoft, Gosford, and at the *Maitland Mercury* office, for the information and guidance of persons desirous of tendering for the work, who were informed in the advertisements that, upon application to Mr. Forest Ranger Coberoft, he would point out to them the land to be cleared and fenced; and, in response to these advertisements, tenders for the work were received.

April. Authority was granted for the employment of a man to clear off the undergrowth from around the young cedar trees planted or self-sown on the Dorrigo forest reserve during the years 1884–85; consequently, a man has since been employed on this work and in planting vacant spaces where trees had died, and in sowing cedar seeds in ground prepared and enclosed for the purpose, the object being to raise a plentiful stock of cedar plants to enable the planting of cedar on the forest reserves to be annually proceeded with.

May. By the request of the New South Wales Commission for the London, Indian, and Colonial Exhibition of 1886, and with the approval of the Honorable the Minister for Mines, detailed letters of instructions and lists of timbers to be collected for the Exhibition were prepared and issued to twelve Forest Rangers stationed in various parts of the Northern and Southern Coast Districts and in the interior, the timbers to be collected to include extra specimens of such kinds as were considered suitable for wood-engraving, veneers, and articles of turnery.

The Forest Rangers were also instructed to collect several specimens of the leaves of each species of tree of which they forwarded a section of timber, with flowers, seeds, and seed-vessels of each kind, if procurable; also gums, resins, fibres, dye-woods, tanning, and medicinal barks, or any kind of vegetable product of commercial value, the Forest Rangers being supplied with the necessary requisites for collecting the specimens required.

As the specimens for the Exhibition were received, arrangements were made with the Commission for their storage, and estimates of the cost of preparing the various exhibits, together with recommendations as to the best modes of preparing the samples and kinds of articles to be prepared for the Exhibition, were submitted to the Commission for its consideration and approval.

The

The clearing of grass and thinning the trees in the wattle plantations on the Southern Railway Line was resumed and completed at a cost to the Department of about £30. The estimated number of wattles left growing in the plantation from Minto to beyond Burradoo, when thinned, being 6,875 trees. May.

Mr. Forest Ranger Rotton reports that the telegraph line repairers have broken off the branches, and cut close to the ground a large number of wattle-trees which were either touching or considered soon likely to come in contact with the telegraph wires.

As this work has been done in such an unskilful manner as to kill or permanently injure a large number of trees which have been planted and kept clear of grass, at a large expense to this Department, it is very discouraging that the trees should be thus destroyed by the telegraph authorities, without reference to this Department, which would, no doubt, have sent an officer and men to lop the branches and remove the trees interfering with the telegraph wires had the necessity for so doing been pointed out to it.

Considering the large expense of forming these plantations on the narrow belts of land on the railway lines, the cost of keeping them clear of grass to prevent them being burned through sparks from the engines igniting it when dry, through their liability to be destroyed through the Railway employés frequently burning off the grass in summer to protect the Railway fences, and to their frequently being killed or damaged by goats kept by Railway employés and others, it is now evident that, under all these discouraging disadvantages, the expenditure incurred in forming and attending to wattle plantations on the railway lines will always largely exceed the revenue hereafter to be derived from the sale of wattle-bark; and I therefore would not recommend any further extension of wattle plantations on the railway lines.

If, in future, it should be considered necessary to continue planting wattles, I would recommend, as I have already done in several reports to the Department, that large blocks of suitable cleared or lightly-timbered land, 100 or more acres in extent, should be cleared, fenced, ploughed, and harrowed for the purpose, and the wattles sown in rows about 2 or 3 feet apart, and the same distance between the seeds in the rows.

The preparation of such blocks of land, thinning out the plants, and clearing off weeds in the plantations, would be much more easily and effectively performed at less cost to the Department, and the trees would be much less liable to injury than if planted on the railway lines.

Ministerial authority having been received for the expenditure of a sum of £300 for planting cedar in forest reserves, six men and an overseer were employed in the beginning of this month to collect seedling-plants and continue the planting of cedar in all the open parts of the Dorrigo forest reserve, Bellinger River District, which work was commenced in 1884. June.

During the month 852 cedar-trees were planted out, and 300 cedar root-cuttings, at a cost for labour of £60 14s. 5d.

The timber specimens commenced to arrive for the Colonial and Indian Exhibition, and were stored at Messrs. Taylor & Co.'s timber yard, Sussex-street, as received.

The planting of cedar on the Dorrigo forest reserve was continued, the number of trees planted for the month being 1,804, and the cost for labour £79 8s. 6d. July.

Cedar planting continued on the Dorrigo forest reserve, the number of trees planted for the month of August being 1,331, and the cost of labour £76 9s. 8d. August.

The planting was suspended during part of this month owing to the soil being too dry.

Ministerial authority having been obtained for the expenditure of the sum of £300 for completing the plantation of catalpas and other trees on the railway reserve at Cootamundra, I engaged the men and proceeded to that town to arrange for the work of fencing, removal of stumps, and trenching the ground to be planted.

During the month of September 1,971 cedar-trees were planted on the Dorrigo forest reserve, at a cost for labour of £76 9s. 8d. September.

The fencing, removal of stumps, and trenching of the land to be planted with catalpa and other trees on the railway reserve, Cootamundra, was proceeded with during the month.

The timber specimens received from the forest rangers for the Colonial and Indian Exhibition were marked, so as to indicate the size and number of pieces into which each log was to be cut; and Messrs. J. Taylor & Co. commenced cutting and planing the samples to be forwarded to the Exhibition, two officers of the Forest Branch being appointed to supervise the cutting of the timbers and numbering of each sample when cut.

Cedar planting was continued on the Dorrigo forest reserve up to the 17th October, at which time planting ceased for the season, and the labourers were discharged. October.

The number of cedar-trees planted up to the 17th October was 300, and 500 holes were prepared for the reception of trees to be planted so soon as a good fall of rain occurred, the ground at this time being too dry to complete planting the holes prepared.

The overseer of the plantation, whose services were retained to remove undergrowth from around the cedar-trees planted in 1884, has since planted the 500 holes; and Mr. Forest-Ranger Mecham, under whose supervision the planting was conducted, reports in December last that the cedar-trees planted are strong and healthy, and that only a very small percentage of them has failed to grow.

In addition to the cedar-trees planted, the Forest Ranger reports that he estimates there are 1,500 self-sown cedar-trees growing on or near the ground planted, and he thinks there are a large number of cedar seedlings on the reserve, the number of which has not yet been estimated.

The total number of cedar-trees planted and self-sown seedlings counted on the Dorrigo forest reserve up to date is 8,258 trees and root-cuttings, and the expenditure for the year on the plantation was £381 17s. 1d.

442 trees of catalpa speciosa having been received from the Conservator of Forests, Adelaide, for the plantation on the railway reserve, Cootamundra, Mr. Forest-Ranger Allen, of Wagga Wagga, was instructed to proceed to Cootamundra to supervise the planting and watering of the catalpa and measurement of the ground trenched for the trees.

Unfortunately, 1,000 trees of the American ash (*fraxinus americana*), also presented to this Department by the Conservator of Forests, Adelaide, for the Cootamundra plantation, were almost all dead when received, only about a dozen of the trees having survived the journey.

Application was then made to the Director of the Sydney Botanic Gardens for a supply of trees to plant in lieu of the American ash, and having received authority to select such trees as were available in the Botanic Gardens and State Nursery, Campbelltown, I procured 730 suitable kinds of trees, and proceeded to Cootamundra with them to supervise the planting, staking, and watering of the trees, and measurement of the ground trenched for the plantation.

418 rods of ground was trenched, 9¼ rods of fencing removed and re-erected across one end of the plantation, 52 stumps were extracted from the ground, and 1,140 trees planted and watered, and about 500 of the trees staked, at a total cost to the Department of about £330.

November. Proceeded to Wyong, Gosford District, to inspect and report upon a site reported by Mr. Forest-Ranger Cobcroft to be suitable for a State Forest Nursery, and recommended the purchase of the land for the reasons explained in my report thereon.

Engaged in naming and arranging in books dried flowering specimens of the timber-trees, sections of which were to be forwarded to the Colonial and Indian Exhibition; also in naming and placing in bags, seeds, seed-vessels, gums, and resins, &c., of same, and in packing them for shipment to London.

December. Occupied during the whole of the month in naming, arranging, and packing exhibits for the Colonial and Indian Exhibition, and in preparing descriptive lists of same for insertion in the Official Catalogue of the New South Wales Exhibits; and with this work I was assisted by Messrs. Forest-Rangers White and Rudder, and Mr. John M'Coig.

I am also indebted to the Rev. Dr. Woolls, F.L.S., of Richmond, for naming a number of the dried flowering specimens for the Exhibition, which were either unknown to me, or of which I was dubious of their identity.

Office Work.

Numerous letters and reports have been written, and a considerable portion of my time has been occupied by persons requiring information on various subjects, and in perusing Forest Rangers' and other reports submitted to me for advice.

Collections of plants, dried specimens, and seeds have been prepared and forwarded to several correspondents; and my time was for a lengthened period devoted to the preparation and despatch of the Forestry Exhibits for the Colonial and Indian Exhibition.

I would respectfully suggest that the services of a junior clerk should be permanently at my disposal, as my time is altogether too much occupied with unimportant office routine to permit me to properly attend to the most important and pressing duties of my office.

State Forest Nursery.

As the site for the State Forest Nursery on Hogan's Brush forest reserve, near Gosford, was reported by Mr. Licensed-Surveyor Harris to be subject to inundation, and the cost of forming a road and several bridges through private property thereto, were considered obstacles to its selection for the nursery site, I recommended that Mr. Forest-Ranger Cobcroft should be instructed to ascertain and report if a suitable site could be purchased in the district, at less expense than the clearing of the land and construction of the road and bridges to Hogan's Brush would cost. Mr. Cobcroft accordingly reported that he had fixed upon a site at Wyong, which he considered suitable for the purpose. I therefore proceeded to inspect the site, and recommended its purchase, not only on account of the expense of buying the cleared land at Wyong being less than to clear the land on Hogan's Brush and form a road thereto, but for various other reasons which I have, or can furnish, in favour of the Wyong site being the best adapted for a State Forest Nursery for raising miscellaneous species of timber-trees, and to my recommendations and opinions on the subject I firmly adhere, notwithstanding that my views have been opposed by several gentlemen whom I maintain are not more capable of selecting a suitable site for the nursery, or more likely to have a deeper interest in the welfare of the Forest Branch than myself, considering our relative positions.

As I have been occupied continuously in the practical and theoretical work in the various branches of my profession, including nurseries, for a period of thirty years, I trust that this long experience may be considered a sufficient guarantee of my competency, and I appeal to the Honorable the Minister and Under Secretary for Mines to uphold me in my position, and to assist me in my endeavours to speedily establish the nursery, which is so essential to the progress and welfare of the Forest Branch, as it must be apparent that my efforts to form plantations of indigenous and imported timber trees throughout the Colony can only be comparatively futile until a plentiful supply of young trees are placed at my disposal.

I am supported in my opinion that the Wyong site for the nursery is the most suitable by that of Mr. J. F. Fergusson, nurseryman, of Sydney and Camden, who inspected the site recommended with me, and who also has had extensive Home and Colonial experience in nurseries.

List of timber specimens and other forestry exhibits forwarded to the London, Colonial, and Indian Exhibition.

It is suggested that about 200 copies of this list, which was carefully compiled for insertion in the Official Catalogue of New South Wales Exhibits, from information received from the Forest Rangers, my own knowledge of the trees, and all available reliable publications on the subject, should be printed separately for distribution amongst the Forest Rangers, kindred departments, and presentation to individuals requiring information respecting the timber-trees of this Colony for purposes of trade and export.

Forest Flora.

There are now seven drawings of leaves, flowers, fruit, wood, and bark of indigenous timber-trees, prepared from specimens obtained from each species of tree, of which drawings have been made, and information sufficient to popularly describe most of the species has been collected; and when the drawings have been lithographed the first part of the work can be published.

Delay in publishing the first part of the work has been caused through fruit, wood, and bark of the species illustrated not usually being procurable at the same time or season as the leaves and flowers, and to the preparation of forestry exhibits and other work of an urgent nature preventing its completion and issue.

Drawings of five other species of indigenous timber trees are completed, with the exception of the fruit, which will be attached to them when obtainable.

Collecting

Collecting dried specimens, seeds, and plants of indigenous timber-trees.

It is recommended that the Forest Rangers be instructed to collect annually dried flowering specimens and seeds of the timber-trees in their districts, also plants of such species of timber-trees as may be indicated to them.

The seeds and plants will be required in the Forest Nursery, and surplus specimens, seeds, and plants for exchanging with kindred Departments.

Thinning and scrubbing on forest and other reserves.

There has not been much work done during the year by the Crown lessees in thinning and scrubbing on forest reserves, owing probably to the scrub clauses of the Land Act not being fully understood, or to delay through applications having to be referred to the Land Boards and the District Forest Rangers for reports.

Permissions to thin saplings and remove scrub on forest reserves should also include authority to ringbark useless trees, which only retard the growth of those around them, and prevent the growth of saplings, excepting in districts where timber is very sparsely distributed, and, although of inferior quality, is useful for fencing, shade, shelter, &c.

The following permissions to thin and scrub have been granted, and on some of the reserves the work is in progress, viz. :—On reserves No. 1,799, county of Urana; No. 1,830A, county of Bland; No. 3,263, county of Wakool. Work is in progress on reserves No. 1,830A, county of Bland; No. 1,880, county of Townsend; Nos. 2,216, 2,217, 2,696, all in county of Urana; and No. 1,445A, in county of Wakool.

Cedar and other plantations.

It is recommended that the trees in the plantations at Cootamundra and East Maitland be pruned and staked, the weeds removed, and all vacancies where trees have died replanted during the forthcoming winter and spring; also, that additional plantations of cedar and other trees be made in suitable localities, for which work, if approved, a sum of from £700 to £800 will be required.

The Rain-tree (Pithecolobium Saman).

In accordance with instructions received from the Honorable J. P. Abbott, M.P., Minister for Mines, in 1884, a quantity of seeds of the above tree was procured from the Royal Botanic Gardens, Calcutta, and by the Minister for Mines from Queensland, a portion of which was forwarded to the Director of the Sydney Botanic Gardens, and to several of the Forest Rangers, chiefly in the northern coast districts, for planting.

From reports received it is evident that the warmest parts of this Colony are too cold for cultivating this tree successfully, as six plants which sprung up and grew vigorously during the summer on the Richmond River, Mr. Forest-Ranger Green reports, were killed to the ground last winter, and only one tree recovered the following summer, which is now alive, although unhealthy, and will probably not survive the coming winter.

The northern parts of Queensland, Fiji, and New Guinea, would most probably be adapted for cultivating the rain-tree; but as I can procure a dozen or more strong plants, established in pots, I purpose, during the ensuing spring or early in summer, to forward a few plants to each of the Forest Rangers stationed in the warmest parts of this Colony for a further trial.

List of indigenous timber specimens now prepared and to be exhibited in the Geological Museum of the Mines Department.

The timber specimens arranged on the ground floor of this Department, which, owing to the light for their inspection being defective, could not be properly examined, have been presented and transferred to the Technological Museum, and a collection of 214 small timber blocks 6 x 4 x 2 have been prepared for exhibition in the Geological Museum of this Department, a list of the botanical and local names of which is hereto appended.

It is intended to exhibit in show cases in connection with the timbers, seeds, and seed-vessels of the timber specimens; also dried leaves and flowers of each species, arranged in books, gums, resins, fibres, tanning and other barks, and articles of turnery, &c.

LIST of indigenous Timber specimens now prepared and to be exhibited in the Geological Museum of the Mines Department.

Botanical name.	Local name.
Acacia linifolia	Sallow.
,, doratoxylon	Spearwood.
,, longifolia	Long-leaved wattle.
,, cunninghamii	Bastard myall
,, aneura	Mulga.
,, pendula	Boree, myall.
,, glaucescens	Brigalow.
,, melanoxylon	Blackwood.
,, binervata	Hickory.
,, sp. (?)	Ironwood.
,, decurrens	Green wattle.
,, ,, var. Mollis.	Silver wattle.
,, homalophylla	Curly yarren.
,, notabilis	Hickory.
,, hakeoides	Black wattle.
Alphitonia excelsa	Leatherjacket, red ash.
Avicennia officinalis	Mangrove.
Aphananthe philippinensis	Elm, tulipwood.
Akania hillii	
Angophora sp. ?	Apple-tree.
,, intermedia	,,
Achras australis	Black apple.
Ackama Muellerii	Corkwood.
Banksia integrifolia	Honeysuckle.
Backhousia myrtifolia	Scrub myrtle.
Casuarina stricta	She oak.
,, ,, mas	He oak.
,, Cunninghamiana	River oak.
,, torulosa	Forest oak.
Ceratopetalum apetalum	Coachwood.
,, gummiferum.	Christmas bush.
Callistemon lanceolatus	Water gum.
Cedrela toona	Red cedar.
Cryptocarya obovata	She beech.
,, glaucescens	
,, var reticulata	Grey sassafras.
,, Meissnerii	Leatherjacket.
,, australis	Laurel.
Cupania semiglauca	White bark.
Cargillia pentamera	Black myrtle.
Dysoxylon Fraserianum	Rosewood.
,, sp ?	Bog onion.
,, Muellerii	Pencil cedar.
Dodonæa lobulata	Giant hopbush.
Diploglottis Cunninghamii	Tamarind tree.
Daphnandra micrantha	Light yellow-wood.
Duboisia myoporoides	Corkwood.
Eremophila mitchellii	Rosewood.
,, sp. ?	Whitewood.
,, longifolia	Berrigan.

Botanical name.	Local name.
Eremophila sp. ?	Budda, sandalwood.
Eucalyptus populifolia	Bimbil box.
,, sp. ?	White gum.
,, macrorhyncha	Stringybark.
,, bicolor	Slatey gum.
,, punctata	Red gum.
,, sp. ?	White gum.
,, tereticornis	Blue or grey gum.
,, sp. ?	Mountain gum.
,, rostrata	Red gum.
,, virgata	Mountain ash.
,, longifolia	Woollybutt.
,, microcorys	Tallowwood.
,, saligna	Flooded gum.
,, melanophloia	Silver-leaved ironbark.
,, largiflorens	Cooburn.
,, sp. ?	Gum.
,, tesellaris	Carbeen.
,, sideroxylon	Ironbark.
,, leucoxylon	Red ironbark.
,, hemiphloia	Grey box.
,, sp. ?	Gum.
,, brachypoda	Goborra.
,, amygdalina	Messmate.
,, sp. ?	Coolibah.
Euphorbiaceæ, genus ?	From Richmond River.
Endiandra glauca	Teakwood.
,, laurina	Redwood.
,, Sieberii	Corkwood.
Elæocarpus grandis	Blue fig.
,, cyaneus	White boree.
,, holopetalus	Blue-berry ash.
Eugenia myrtifolia	Brush cherry.
,, sp. ?	,,
,, jambolana	Durobbi.
,, Ventenattii	Large-leaved water gum.
Echinocarpus australis	Maiden's blush.
Euroschinus falcatus	Jemmy Donnelly.
Erythrina vespertilio	Batswing coral.
Ficus macrophylla	Moreton Bay fig.
,, aspera	White fig.
Frenela robusta	White pine.
,, ,, var microcarpa.	Richmond white pine.
Frenela rhomboidea	Illawarra pine.
,, Macleayana	Port Macquarie pine.
Flindersia Bennettiana	Teak—Bulboro.
,, maculosa	Spotted tree.

Botanical name.	Local name.
Flindersia Oxleyana	Yellowwood.
Fusanus acuminatus	Quandong.
Gmelina Leichhardtii	White beech
Grevillea robusta	Silky oak.
,, striata	Beefwood.
,, Hilliana	White yiel yiel.
Geijera salicifolia	Balsam of copaiba.
,, ,,	Wilga.
Genus ? Verbenaceæ	Colonial deal.
Genus ? Laurineæ	She beech.
Geissois Benthamii	Leatherjacket.
Hemicyclia australasica	
Helicia prealta	Nut tree.
Harpullia pendula	Tulipwood.
Hakea dactyloides	Turmeric.
Litsæa dealbata	Pigeon-berry tree.
Melia composita	White cedar.
Myoporum acuminatum	Dogwood.
Melaleuca styphelioides	Prickly-leaved tea tree.
,, armillaris	Tea tree.
Myrtus acmenioides	Lignum vitæ.
Macadamia ternifolia	Queensland nut.
Nephelium sp. ?	Scrub ironbark.
Notelœa ovata	Native olive.
Olea paniculata	Marble-wood.
Orites excelsa	Red ash.
Podocarpus spinulosa	Native plum.
Panax elegans	White sycamore.
Phyllanthus Ferdinandii	White beech.
Rhodamnia argentea	White myrtle.
Rhus rhodanthema	Yellow cedar.
Stenocarpus salignus	Beefwood.
Sterculia diversifolia	Kurrajong tree.
Schizomeria ovata	Corkwood.
Synoum glandulosum	Brush bloodwood.
Syncarpia leptopetala	Brush turpentine.
,, laurifolia	Turpentine
,, var. glabra	Turpentine.
Tarrietia argyrodendron	Ironwood.
,, actinodendron	Stavewood.
Trema aspera	Elm. Rough fig.
Tristania laurina	Swamp mahogany.
,, conferta	Brush box.
Ventilago viminalis	Supple jack.
Weinmannia rubifolia	Corkwood.
Zanthoxylum brachyacanthum.	Satinwood.

Plants and seeds received.

1885.
17th February. Received from C. J. Horsley, Esq., Crown Lands Agent, Mudgee, seeds of Hakea leucoptera.

September. Received from J. E. Brown, Esq., F.L.S., Conservator of Forests, Adelaide, 1,000 plants of Fraxinus americana, the American Ash, and 500 plants of Catalpa speciosa.

September. Received from Mr. Forest-Ranger Mecham, Boat Harbour, 200 plants of araucaria Cunninghamii, the Hoop or Moreton Bay pine.

October Received from Charles Moore, Esq., F.L.S., Director, Botanic Gardens, Sydney, 767 trees, consisting of turpentine, eucalypt, silky oak, catalpa, kurrajong, brush box, pinus insignis, evergreen oak, American ash, camphor, olive, and Moreton Bay pine.

November. Received from H. Wilkinson, Esq., J.P., about 200 plants of araucaria excelsa, the Norfolk Island pine, and a quantity of seeds of Kentia Forsteriana, and K. Belmoreana, the thatch, and curly palms of Lord Howe Island.

Plants, seeds, dried specimens, &c., presented by Forest Branch, Department of Mines.

1885.
24th January. Sent to Baron Mueller, K.C.M.G., F.R.S., Government Botanist, Melbourne, 100 dried flowering specimens of eucalypt and other indigenous trees.

24th January. Sent to Baron Mueller, seventy species of indigenous seeds, seed-vessels, and two copies of Nilson's Pamphlet on the timber-trees of New South Wales.

25th February. Sent to Baron Mueller, thirty-five dried flowering specimens of indigenous eucalyptus.

25th February. Sent to Baron Mueller, five species of seeds and seed-vessels of indigenous eucalypt.

26th February. Sent to E. W. Moon, Esq., Consul General, Republic of Costa Rica, Central America, forty-two species of eucalypt, and other indigenous tree seeds.

25th August. Sent to W. H. Wesley, Esq., Tintern, Parramatta, twenty-four plants of Catalpa speciosa.

25th August. Sent to the Honorable J. P. Abbott, Esq., M.P., Minister for Mines, thirteen plants of Catalpa speciosa.

Sydney: Thomas Richards, Government Printer.—1886.

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

FOREST BRANCH, DEPARTMENT OF MINES.

(RETURN SHOWING INCREASES TO OFFICERS OF.)

Ordered by the Legislative Assembly to be printed, 10 *February*, 1886.

RETURN to an *Order* of the Honorable the Legislative Assembly of New South Wales, dated 4th February, 1886, That there be laid upon the Table of this House,—

"A Return showing the increases to Officers of the Forest Branch, Mines "Department, under the Civil Service Act, specifying the dates upon "which such increases commenced."

(Mr. Fitzgerald.)

INCREASES to Officers of the Forest Branch, Mines Department.

No. of Officers.	Offices.	Classification under Civil Service Act.	Increase under Civil Service Act, from 1st January, 1885.
1	Inspector of Forests	4th Class ...	£20.
1	Chief Clerk	5th do ...	£20.
1	Clerk	5th do ..	£20.
2	Do	6th do ...	£20 each.
2	Forest Rangers, acting as Clerks	5th do ...	£20 each.
2	Junior Forest Rangers, acting as Clerks ...	6th do ...	£20 each.
7	*1st Class Forest Rangers	7th Section	£5 from 1st January, 1885. £10 do do 1886.
21	2nd Class Forest Rangers	7th do ...	£5 do do 1885.
10	Assistant Forest Rangers	7th do ...	£5 do do 1885.

* Ranked as 1st Class under 7th section of the Civil Service Act, from 1st January, 1886.

[865 copies—Approximate Cost of Printing (labour and material), £1 6s. 6d.]

[3d.] 215—

1885–6.

NEW SOUTH WALES.

TIMBER AND STATE FORESTS.

(CANCELLATION OF PART OF THE 26TH REGULATION OF 18TH AUGUST, 1885.)

Presented to Parliament, pursuant to Act 39 Vic. No. 13, sec. 39.

Department of Mines, Sydney, 6th August, 1886.

It is hereby notified, for general information, that His Excellency the Governor, with the advice of the Executive Council, has been pleased to revoke that part of the 26th Timber and State Forest Regulation, of 18th August, 1885, which imposes a royalty of 6d. per cord of 128 feet upon dead wood and loppings for fuel removed from State Forests and Timber Reserves, Class C.

JAMES FLETCHER.

[3d.] 812—

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

TIMBER AND FOREST RESERVES.

(ON THE MURRAY, EDWARDS, WAKOOL, BILLABONG, AND MURRUMBIDGEE RIVERS.)

Ordered by the Legislative Assembly to be printed, 16 *September*, 1886.

[*Return to a Question asked by R. Barbour, Esq., M.P., on the 16th September*, 1886, *respecting certain Timber and Forest Reserves on the Murray, Edwards, Wakool, Billabong, and Murrumbidgee Rivers.*]

QUESTIONS.

1. What is the area of the timber and forest reserves on the Murray River, down stream from Moama?
2. Have any timber blocks for saw-mills been taken there, giving area and situation?
3. What is the area of the timber and forest reserves on the Murray River, up stream from Moama?
4. Have any timber blocks for saw-mills been taken there, giving area and situation?
5. How much money has been received from the timber reserves on the Murray, up stream from Moama, for rents, royalty, and licenses, during the several years since these reserves were made in 1871?
6. What is the area of the timber reserves on the Edwards, Wakool, Billabong, and the Murrumbidgee Rivers?
7. Have any timber blocks for saw-mills been taken on any of these rivers; if so, state area and situation?
8. How much money has been received for rents, royalty, and licenses from the timber reserves on these rivers during the year 1885?

ANSWERS.

1. Area of timber and forest reserves on Murray River from Moama down to South Australia border, 148,940 acres (proposed to be reduced by 42,460 acres).
2. Yes, twelve, viz.:—

Reserve No. 3,258, County of Wakool.	Block	50,	3,200 acres,	Parish of Cangan.
	„	52,	3,200 „	„ „
	„	53,	3,200 „	„ „
	„	55,	3,200 „	„ Tittil.
Reserve No. 2,066, County of Wakool.	„	65,	640 „	„ Nunnagoyt.
	„	66,	640 „	„ „
Reserve No. 3,254, County of Cadell.	„	47,	1,440 „	„ Tantonan.
	„	49,	1,280 „	„ „
	„	49*a*	1,280 „	„ „
	„	47*a*	960 „	Parishes of Tantonan and Yarraman.
	„	46,	2,750 „	„ Tantonan, Yarraman, and Burrumbury.
	„	49*b*	2,770 „	Parish of Tantonan.

3. Area of timber and forest reserves on the Murray River from Moama up to its source, 140,902½ acres (proposed to be reduced by 29,680 acres).
4. Yes, fourteen, viz.:—

Reserve No. 3,265, County of Townsend.	Block	4,	2,560 acres,	Parish of Wonnur.
	„	5,	2,560 „	Parishes of Wonnur and Narratoola.
	„	11,	2,240 „	Parish of Tawarra.
	„	12,	2,560 „	„ „
	„	1,	780 „	„ Wonnur.
Reserve No. 3,253, County of Cadell.	„	33,	1,050 „	Parishes of Bama and Moira.
	„	34,	1,240 „	„ „
	„	35,	1,500 „	Parish of Bama.
Reserve No. 3,263, County of Townsend.	„	1,	1,000 „	„ Nallam.
	„	2,	1,000 „	„ „
	„	3,	1,000 „	„ „
Reserve No. 3,265, County of Townsend.	„	1,	640 „	Parishes of Bullatella and Coronalla.
	„	2.	640 „	Parish of Derulaman.
Reserve No. 3,216, County of Denison.	„	4,	1,200 „	„ Mulwala.

5. Amount received from up-stream reserves for 1879, £97 10s.; 1880, £395 6d.; 1883, £295 7s. 6d.; 1884, £851 7s. 8d.; 1885, £1,436 13s. 4d. The information for the other years since 1871 cannot be supplied, the records having been burnt in the Garden Palace fire.
6. Timber reserves on Edwards, Wakool, Billabong, and the Murrumbidgee Rivers, 147,895¾ acres (proposed to be reduced by 29,320 acres).
7. Yes, eight, viz.:—

On Murrumbidgee—

Reserve No. 2,989, County of Sturt.	Block	1,	719	acres,	Parishes of Benerembah and Wowong.
	„	2,	700	„	Parish of Bringagee.
Reserve No. 2,984, County of Cowper.	„	1,	1,160	„	Parishes of Coolaragang and Cuba.
Reserve No. 2,988, County of Cowper.	„	1,	1,120	„	Parish of Yarrangery.
„ „	„	2,	800	„	Parishes of Yarrangery and Cudgel.

County of Cowper—

Reserve No. 2,993,	„	1,	300	„	Parish of Dallas.
„ No. 2,992,	„	1,	800	„	„ Coolaragong.
„ No. 182,	„	1,	1,280	„	„ Carabury.

8. £13, exclusive of pastoral rents.

Sydney: Thomas Richards, Government Printer.—1886

[3d.]

1885–6.

NEW SOUTH WALES.

PUBLIC PARKS BRANCH, DEPARTMENT OF MINES.

(REPORT FOR 1885.)

Presented to Parliament by Command.

Department of Mines, Public Parks Branch, Sydney, 12 January, 1886.

I HAVE the honor to report as follows upon the operations of this Branch since the date of its transfer from the control of the Colonial Secretary to that of the Secretary for Mines, to the end of last year, a period of eleven months :—

2. By notification in the Gazette of 20 January, 1885, the administration of public parks and recreation grounds, other than reserves, was placed under the control and direction of the Secretary for Mines.

3. By notification in the Gazette of 9 June, 1885, the business connected with the Land for Public Purposes Acquisition Act, 44 Victoria No. 16, vested in the Secretary for Public Works, so far as relates to public parks or grounds for public recreation or places for bathing, was placed under the control and direction of the Secretary for Mines.

4. By letter from the Under Secretary for Lands, dated 11 November, 1885, the dealing with all matters relating to recreation reserves was handed over to the Department of Mines.

5. Since 29 January, 1885, the date on which the removal of the Parks Branch from the Colonial Secretary's Department took place, the following have been the numbers of papers registered and letters written :—

Number of papers registered	1,033
Number of letters written	480

6. Besides the above, Executive minutes, notices of appointment of trustees for public parks for insertion in the Government Gazette, proclamations of parks under the "Public Parks Act of 1884," and notifications of resumption of land for public parks under the Lands for Public Purposes Acquisition Act, also for insertion in the Government Gazette, have been prepared in this Branch.

7. As this is the first general report which has been drawn up on the operations carried on for about four years relative to the acquisition of land for the purposes of public recreation, I beg to furnish the following statement of what has been done, and what still remains to be done in order to carry out the purpose for which the votes were passed by Parliament.

8. Of the two sums of £100,000 each, voted by Parliament in 1881 and 1883, £199,250 1s. 4d. has been spent, leaving a total balance in hand of £749 18s. 8d., against which liabilities have been incurred to the amount of £59,720.

9. It thus appears that a total sum of about £259,000 has been spent or engaged to be spent in the acquisition of public recreation grounds in places where such were absolutely required, and there was no Crown land available for the purpose, and that therefore a vote of say £60,000 will be required to fulfil arrangements actually entered into.

10. For the above sum of £259,000 the parks set forth in Schedule 1 hereto attached have been procured, the area and cost of each being as severally stated therein.

11. It may be remarked that, as many of these lands were acquired several years ago, their value has since considerably increased, and they are now worth much more than the price given for them. I should imagine that the increase is at least 25 per cent. all round.

12. It should be added that a few parks, other than those specified already, have been acquired, which were not paid for out of the two £100,000 votes. Of these the following have come to my knowledge :—

Paterson,
Rushcutter Bay,
Waverley Water and Recreation Reserve,
Ashfield,

and there may possibly be a few others.

13.

[1,258 copies—Approximate cost of printing (labour and material), £6 15s.]

13. The action which has been taken in acquiring land for public parks has had three objects in view: the first to provide suitable places for the population of towns to carry on games and sports; the second to obtain and set apart for the enjoyment of the public for all time lands containing objects of remarkable natural beauty, which had been alienated from the Crown; and the third, to prevent the ill effects on the health of the community of mud flats, swamps, and other lands difficult of drainage.

14. I venture to submit that not one of these objects is as yet fully attained. There are still many places in the Colony where play-grounds are required and not yet provided, and in respect to these the applications named in Schedule 2 have been received by the Department.

15. There are also many places possessing great natural beauty, which it appears to me should be secured to the public without delay. Of this kind are the lands appearing in the following applications which have been received:—

Lake Macquarie,
Murrurundi,
Bronte (Nelson Bay),
Deno Point and Willoughby Falls,
Cremorne,
Waverley (Fletcher's Glen),
Bulli Pass,
Waragamba,
Lake Illawarra,
Mount Kembla.

16. Of these there are two in regard to which, I think, it is specially desirable that the opportunity which at present exists of acquiring them should not be allowed to lapse, namely, Bulli Pass and Fletcher's Glen. It would be a national calamity if the romantic beauty and luxuriant sub-tropical vegetation of the Bulli Pass should be destroyed, as it is certain to be before very long, unless it is made public property, and placed under efficient control. The Illawarra Railway will shortly bring its charms within an hour or two's reach of Sydney, some of the land will probably be sold in small allotments, and cleared, and the rest will be greatly marred by indiscriminate gathering of plants, leaves, and flowers, and thus its wonderful beauty of palms, fern-trees, ferns, creepers, and moss covered rocks will gradually but surely be destroyed.

17. Similar considerations urge the acquisition of Fletcher's Glen at Bondi. This is undoubtedly the most picturesque spot in the immediate vicinity of Sydney, and contains within an area of 20 acres a remarkable combination of beauty, in its terraces of rocks, deep glens, waterfalls, streams, lake, trees, and flowers, secluded bay, and massive sea cliffs of picturesque form. The whole has been well laid out and planted at great expense, and with good judgment. The property happens to be at present in the market, and can be obtained for a moderate price, but if not acquired now the opportunity is not likely ever to recur. It is probably a unique circumstance for a great city to have two such rural paradises in its close proximity.

18. Round the whole circumference of Lake Illawarra there is not an acre of recreation reserve. Some parts of it are within 1½ mile of the Illawarra Railway, and several charming spots could be selected for parks which would probably in time become places of great public resort. So would the summit of Mount Kembla, which has unfortunately also been alienated, and which will likewise be within easy reach of the railway line.

19. The extension of the reserve on both sides of the Waragamba Gorge to Penrith Bridge, by acquiring a strip of land 100 feet wide along the bank of the Nepean River, would provide access to the finest river reach in the Colony, and much facilitate public recreation, boating and otherwise.

20. There are several localities on the shores of Port Jackson which are admirably adapted as beauty spots for the delectation of the inhabitants of the crowded metropolis—Cremorne, for instance, where the long narrow peninsula which culminates at Robertson's Point, affords extensive views up and down the harbour; of such a park the 100 feet reservation in the original grant would form a continuation on both sides, along which a carriage drive of remarkable beauty could be constructed.

21. In the third category alluded to in paragraph 13, where the acquisition of land is made for sanitary considerations, that is, where the ground lies so low as to be unfit for human habitation, or where pestiferous mud flats constitute a danger to the health of the surrounding inhabitants, are the following applications:—

Rushcutter,
Mosman Bay,
Neutral Bay,
Careening Cove,
Blue's Bay.

22. That the public health would be benefited by the conversion of these low-lying sites into public parks there can be, I think, no doubt. Rushcutter Bay, Double Bay, and Blackwattle Bay have been so treated already. Much of the land round the head of Snail's Bay and Rose Bay has been acquired with this object in view, and there are several other bays in addition to the list above given, White's Bay for example, where reclamation is also highly necessary.

23 Applications not coming under either of the foregoing heads have been received from the following places and have not yet been dealt with:—

Ryde,
Narabeen,
Woollahra,
Adelong,
Paterson,
Scone,
Bowna.

24. For the reasons given in the ten preceding paragraphs I beg respectfully to suggest to the Minister the desirability in the public interest of placing on the Estimates for 1886 a sum of not less than £100,000 for the acquisition of land for public parks, £60,000 or thereabouts being required to clear off existing liabilities, and the balance to be devoted to fresh acquisitions where urgently required.

W. M. COOPER,
Surveyor of Public Parks.

P.S.—Copies of the two notifications in the Gazette referred to in paragraphs two and three of the foregoing, and of the letter from the Under Secretary for Lands, dated 11/11/85, are attached hereto, as also a Return of lands resumed for Public Parks to date—W.M.C.

[*Enclosures.*]

[*Extract from Government Gazette No.* 25, *of* 20*th January*, 1885, *p.* 553.]

Colonial Secretary's Office, Sydney, 20 January, 1885.

ADMINISTRATIVE ARRANGEMENTS.

His Excellency the Governor, with the advice of the Executive Council, has approved of the office of the Surveyor of Public Parks and all matters relating to Public Parks and Recreation Grounds, other than Reserves, being placed under the Ministerial control and direction of the Secretary for Mines.

WILLIAM BEDE DALLEY.

[*Extract from Gazette No.* 232, *9th June*, 1885, *p.* 3611.]

Colonial Secretary's Office, Sydney, 2 June, 1885.

ADMINISTRATIVE ARRANGEMENTS.

With reference to previous notices, His Excellency the Governor, with the advice of the Executive Council, has been pleased to approve of the business connected with the administration of the "Lands for Public Purposes Acquisition Act," 44 Victoria, No. 16, vested or imposed upon the Secretary for Public Works, so far as relates to Public Parks or Grounds for Public Recreation or Places for Bathing, and to the reclamation of land for or in connection therewith, being under the Ministerial control and direction of the Secretary for Mines, and of the same Minister being charged, in accordance with the terms of section 2 of the "Executive Councillors (Functions Substitution) Act," with the powers, duties, and obligations pertaining to the administration of the business specified.

ALEX. STUART.

Sir, Department of Lands, Sydney, 11 November, 1885.

I have the honor to inform you that the Secretary for Lands has approved of all matters relating to Public Parks after dedication being dealt with in your Department, and to forward herewith papers in connection with the same.

I am to add that the Under Secretary for Finance and Trade has been asked to transfer the balances of the 1884 and 1885 votes for improving such reserves to the credit of your Department.

I have, &c.,
CHARLES OLIVER,
Under Secretary.

The Under Secretary for Mines.

Resumptions for Public Parks.

1. Abstract of Lands resumed for the purposes of Public Parks, under the provisions of the Lands for Public Purposes Acquisition Act, 44 Victoria No. 16.

Locality.	County.	Parish.	Area.	Date when resumed.	Remarks.
			a. r. p.		
Camperdown	Cumberland	Petersham	11 1 8½	23 May, 1882	
Leichhardt	do	do	24 2 18	„ „ „	
Bondi Beach	do	Alexandria	25 2 16	9 June, „	
Rushcutter Bay	do	do	0 0 36	28 July, „	This was resumed for an approach to Rushcutter Bay Park.
* Balmain (Pigeon Ground)	do	Petersham	5 0 0¼	22 Sept., „	
Burwood	do	Concord	15 0 0	4 Oct., „	
Macdonaldtown and Alexandria.	do	Alexandria and Petersham.	22 3 8	20 „ „	
Morpeth	Northumberland	Alnwick	39 3 0	30 Mar., 1883	
Clarencetown	Durham	Uffington	3 0 0	28 Sept., „	
Burrawang	Camden	Yarrunga	5 0 0	2 Oct., „	
Quirindi	Buckland	Quirindi	17 1 17	26 Feb., 1884	
Glebe	Cumberland	Petersham	1 0 34	17 June, „	Church and School Lands. Forms addition to Wentworth Park.
Do	do	do	0 0 32	15 July, „	do do
Granville	do	St. John	12 0 0	9 Aug., „	Church and School Lands.
Glebe	do	Petersham	3 2 37	9 Sept., „	Resumed in order to rectify the boundary of Wentworth Park.
Manly (Fairlight)	do	Manly Cove	3 0 35	24 „ „	100 feet reservation.
Muswellbrook	Durham	Brougham	68 0 0	„ „ „	
Rose Bay	Cumberland	Alexandria	6 2 17¾	18 Nov., „	
Bankstown	do	Bankstown	30 2 0	17 July, 1885	Mollet's grant.
Balmain (Birchgrove)	do	Petersham	0 0 27·2	4 Sept., „	Addition to Birchgrove Park.
† Lady Robinson's Beach	do	St. George	105 0 0	20 Oct., „	
Carcoar (South)	Bathurst	Shaw	11 0 7	10 Nov., „	

* Since named Gladstone Park, *vide* Gazette No. 6, of 5 January, 1886, p. 53.

† Since named Cook Park, Botany.

2. ABSTRACT of Lands resumed for the purposes of Public Parks, under powers reserved to the Crown in the original Grants.

Locality.	County.	Parish.	Area.	Date when resumed.	Remarks.
			a. r. p.		
Alexandria	Cumberland	Alexandria	10 0 0	14 Nov. 1882.	Forms part of W. Hutchinson's grant of 1,400 acres.
Botany	do	Botany	10 0 0	23 May, 1883.	Forms part of Simeon Lord's grant of 600 acres.

SCHEDULE 1.

A.—AMOUNT actually expended on each Park up to 31 December, 1885.

	Area.	Expenditure.
	a. r. p.	£ s. d.
Singleton	33 1 13½	2,000 0 0
Canterbury	20 0 0	5,500 7 7
Burwood	15 0 0	15,634 11 8
Manly	9 2 19	7,306 10 0
Burrawang	5 0 0	128 3 4
Wollongong	56 2 0	1,750 0 0
Cudgegong	24 0 3	60 10 0
Fitzroy Falls	200 0 0	804 10 0
West Maitland	58 3 17½	9,600 0 0
Penrith	20 0 0	1,005 0 0
Redfern	12 0 25	34,834 0 0
Marrickville	10 0 0	10,416 13 4
Plattsburg	0 0 32	680 0 0
Redmyre	.....	200 0 0
Petersham	12 2 16	2,371 4 6
Camperdown	14 0 30¾	18,170 12 5
Macdonaldtown	22 3 8	34,749 7 7
Morpeth	39 3 0	1,616 5 0
Wallsend	48 0 0	610 2 6
Balmain Pigeon Ground (now called Gladstone Park) about	5 0 0	15,137 9 3
,, Birchgrove	6 1 13	7,938 10 0
Bondi	25 2 16	2,590 5 10
Leichhardt	24 2 18	5,513 4 0
,, entrances	0 0 21	127 7 0
Rushcutter Bay, additional for approach	0 0 36	399 19 9
Five Dock	22 3 7	5,000 0 0
Springwood	7 0 0	210 0 0
Wentworth, south side	1 0 34	10 10 0
,, east side	3 2 37	2,970 16 2
Albury	14 0 7	746 8 9
Geringong	9 1 28	405 5 6
Katoomba	76 0 17½	1,770 1 10
Willoughby Falls	.....	10 10 0
Rose Bay about	6 2 17¾	7,474 6 2
Paddington, additional	0 2 0	157 10 0
= * Average of £246 per acre	805 1 17	197,900 2 2
† Administration—to 31 December, 1883.		
Salary of surveyor	203 10 0	
Wages of chainmen	173 1 6	
Travelling expenses	59 19 8	
Contingencies	1 18 0	
Commission	911 10 0	
		1,349 19 2
	£	199,250 11 4

* This amount will be increased to somewhat over £300 when all are fully paid for.

† Afterwards charged to specific items voted by Parliament for the purpose.

B.—Amounts still owing.

		£ s. d.	
Rose Bay	D. Cooper	10,197 0 0	Valuation not yet accepted.
,,	Douglass	575 0 0	Accepted.
,,	Lochhead	350 0 0	do
Petersham	Paling	6,515 0 0	do
,,	Searl	3,882 0 0	do
,,	Taylor	560 0 0	do
,,	Creswick	800 0 0	do
,,	Hart	1,076 0 0	Valuation not accepted.
Wentworth	J. Harris	13,480 0 0	Claim not yet valued.
,,	Withers	3,069 0 0	Valuation not accepted.
Bondi	O'Brien	7,500 0 0	Verdict of Jury, £6,888.
Bowral	Neich	700 0 0	Accepted.
Bulli	Croft	1,076 0 0	do
Cassilis	Busby	290 0 0	do
Quirindi	Loder	500 0 0	No claim made.
,,	Fogarty	100 0 0	do
Muswellbrook	Bowman	1,400 0 0	Valuation not accepted. Action commenced.
West Maitland	Eales	400 0 0	Accepted.
Birchgrove	Muir	1,200 0 0	Claim not valued.
Lady Robinson's Beach (now called Cook Park).	Various owners	1,300 0 0	Claims not yet all received.
Wickham		4,000 0 0	Accepted.
Carcoar (South)		750 0 0	
		£59,720 0 0	

SCHEDULE 2.

SCHEDULE 2.

List of additional applications for Public Parks.

A. Those which have been granted.

Locality.	Area.	Estimated value.
	a. r. p.	£ s. d.
Moss Vale	12 0 0	600 0 0
Bombala	5 0 0	250 0 0
Kiama	2 0 0	1,500 0 0
Lake Macquarie	15 0 0	1,500 0 0
Ulmarra	not defined.	500 0 0
Murrurundi	94 0 0	1,000 0 0
Bronte, Nelson Bay	7½ 0 0	6,000 0 0
Willoughby Falls	4½ 0 0	2,250 0 0
Deno Point, Middle Harbour	not defined.	.....

B. Those which have not yet been decided upon.

Locality.	Area.	Estimated Value.	Remarks.
	a. r. p.	£ s. d.	
Cremorne	3 0 0	.....	
Ryde	2 0 0	.....	
Narrabeen	Not defined.	.....	
Woollahra	do	.....	
Waverley, Fletcher's Glen	24 0 0	12,000 0 0	
Rushcutter	30 0 0	30,000 0 0	Valuation.
Mosman's Bay	24 0 0	.....	
Neutral Bay	Not defined.	.....	
Careening Cove	do	.....	
Blue's Bay	4 0 0	.....	
Manly—Chear's Grant	3 0 0	.....	
Birchgrove	2 0 0	3,220 0 0	Valuation.
Bulli Pass	900 0 0	7,000 0 0	
Waragamba	66 0 0	700 0 0	
Adelong	7 0 0	300 0 0	
Bowna	40 0 0	400 0 0	
Lake Illawarra	280 0 0	.....	
Mount Kembla	300 0 0	.....	

[6d.]

Sydney: Thomas Richards, Government Printer.—1886.

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

PUBLIC PARKS.

(AMOUNTS OF CLAIMS FOR, PLACED UPON SUPPLEMENTARY ESTIMATES FOR 1885)

Ordered by the Legislative Assembly to be printed, 27 *May*, 1886, A.M.

RETURN of outstanding Claims placed upon the Supplementary Estimates for 1885.

Name of Park.	Claimant.	Resumption or purchase.	Date of acquisition.	Price.		Remarks
				£	£	
Bondi	O'Brien...	Resumption	9 June, 1882	... ..	9,850	To include verdict of Jury, £6,888 interest and costs. New trial has been granted on the ground of excessive damages.
Quirindi	Loder	,, ...	26 Feb., 1884	550		Estimate only. No claim yet sent in.
	Fogarty ..	,, ...	26 ,, ,,	150		,, No offer yet made.
					700	
Wentworth.	Withers ..	,, ..	17 June, 1884	3,397		Agreed to.
	J. Harris..	,, ...	9 Sept., ——	6,100		Offered, but not yet accepted.
					9,497	
Bowral	Neich	Purchase ...	— July, 1884	.... .	700	Agreed to.
Rose Bay	D. Cooper	Resumption	18 Nov., ,,	5,312		Offered, but not yet accepted.
	Lochhead.	,, ...	18 ,, ,,	395		Agreed to.
	Douglas ..	,, ...	18 ,, ,,	635		,,
					6,342	
Cassilis	Busby ...	Purchase ...	— Sept., ,,	.....	290	,,
Muswellbrook	Bowman ..	Resumption	24 ,, ,,	.....	1,870	Amount offered and refused. Action being brought.
Petersham	Searl	Purchase ...	— Mar., 1885	3,882		Agreed to.
	Paling ...	,, ...	— Mar., ,, / — Dec., ,,	6,515		,,
	Creswick..	,, ...	— Dec., ,,	800		,,
					11,197	
West Maitland	Eales	,, ..	— Aug., ,,	. ....	400	,,
Balmain, Birchgrove	Muir	Resumption	4 Sept., ,,	... ..	1,160	,,
Botany, Cook Park ..	England..	,, ...	20 Oct., ,,	600		,,
	Marks ...	,, ..	20 ,, ,,	500		Offered, but not yet accepted.
					1,100	
Carcoar	.....	,, ...	10 Nov., ,,	.....	1,118	No claim yet sent in.
Bulli	Croft	Purchase ...	— Dec., 1884	. ....	1,076	Agreed to.
					45,300	

The above amount includes interest on resumptions to 31st March 1886 only, also law costs (estimated).

Department of Mines, Public Parks Branch,
Sydney, 26/5/86.

WM. COOPER,
Surveyor of Public Parks.

1885-6.

NEW SOUTH WALES.

LANDS FOR PUBLIC PURPOSES ACQUISITION ACT.

(RESUMPTIONS FOR PUBLIC PARKS.)

Presented to Parliament, in pursuance of Act 44 Vic. No. 16, sec. 6.

ABSTRACT of Lands resumed for the purposes of Public Parks, under the provisions of the Lands for Public Purposes Acquisition Act, 44 Victoria No. 16.

Locality.	County.	Parish.	Area.	Date when resumed.	Remarks.
			a. r. p.		
Camperdown	Cumberland	Petersham	11 1 8½	23 May, 1882	
Leichhardt	do	do	24 2 18	23 „ „	
Bondi Beach	do	Alexandria	25 2 16	9 June, „	
Rushcutter Bay	do	do	0 0 36	28 July, „	This was resumed for an approach to Rushcutter Bay Park.
Balmain (Pigeon Ground)	do	Petersham	5 0 0¼	22 Sept., „	
Burwood	do	Concord	15 0 0	4 Oct., „	
Macdonaldtown and Alexandria.	do	Alexandria and Petersham.	22 3 8	20 „ „	
Alexandria	do	Alexandria	10 0 0	14 Nov., „	Forms part of W. Hutchinson's grant of 1,400 acres.
Morpeth	Northumberland	Alnwick	30 3 0	30 Mar., 1883	
Randwick	Cumberland	Alexandria	10 0 0	23 May, „	Forms part of Samuel Terry's grant of 570 acres.
Clarencetown	Durham	Uffington	3 0 0	28 Sept., „	
Burrawang	Camden	Yarrunga	5 0 0	2 Oct., „	
Quirindi	Buckland	Quirindi	17 1 17	26 Feb., 1884	
Glebe	Cumberland	Petersham	1 0 34	17 June, „	Church and School Lands. Forms addition to Wentworth Park.
Do	do	do	0 0 32	15 July, „	do do
Granville	do	St. John	12 0 0	9 Aug., „	Church and School Lands.
Glebe	do	Petersham	3 2 37	9 Sept., „	Resumed in order to rectify the boundary of Wentworth Park.
Manly (Fairlight)	do	Manly Cove	3 0 35	24 „ „	100 feet reservation.
Muswellbrook	Durham	Brougham	68 0 0	24 „ „	
Rose Bay	Cumberland	Alexandria	6 2 17¾	18 Nov., „	
Bankstown	do	Bankstown	30 2 0	17 July, 1885	Mollet's grant.
Balmain (Birchgrove)	do	Petersham	0 0 27·2	4 Sept., „	Addition to Birchgrove Park.
Lady Robinson's Beach	do	St. George	105 0 0	20 Oct., „	
Curcoar (South)	Bathurst	Shaw	11 0 7	10 Nov., „	

Department of Mines,
11/12/85.

W. M. COOPER,
Surveyor of Public Parks.

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

NATIONAL PARK.

(MONEY VOTED FOR AND SPENT UPON.)

Ordered by the Legislative Assembly to be printed, 14 *October*, 1886.

[*Laid upon the Table of this House, in accordance with promise made, in answer to question No.* 5, *Votes No.* 147, *Thursday*, 14*th October*, 1886.]

5. MR. SYDNEY SMITH *to ask* THE COLONIAL SECRETARY,—
   (1.) How much public money has been voted for the National Park since it was first set apart for public purposes?
   (2.) How much of the same has been spent upon the Park?
   (3.) What is the nature of the work that has been done for the money so expended?
   (4.) Who are the Trustees of the Park?

1. £17,950.
2. £17,672 7s. 3d. (during seven years.)
3. The principal works effected at the Park are:—
   Construction and maintenance of roads, bridges, and pathways.
   Construction and maintenance of dam across Port Hacking River, near Audley.
   Work towards construction of dam across Port Hacking River, between the "Lower Peach Trees" and the "Upper Peach Trees."
   Excavation of water-tanks.
   Land-clearing, under-scrubbing, stumping, and tree-planting.
   Erection of Park boundary fencing and other fencing.
   Removing fallen timber and detached rocks from Port Hacking River and Kangaroo Creek to facilitate navigation.
   Erection of training-walls in Port Hacking River, below dam, near Audley.
   Construction of small dock, Port Hacking River, near Audley.
   Erection of slip and shed for hauling and repairing steam launch and boats.
   Erection of boat-house, jetties, pavilions, caretaker's cottage, cottages for carpenter, groom, and labourers, erection of stables, stores, smithy, and outhouses.
   The above-stated sum of £17,672 7s. 3d. also includes cost of boats, punts, steam launch, waggons, drays, horses, forge, tools, and other plant, furniture, and fittings, purchased or constructed for Park purposes, and cost of caretaking, secretarial work, &c.
   Information in detail is furnished in the Report of the Park Trustees, dated 26th May, 1884 (which was laid upon the Table of the Legislative Assembly on the 26th August, 1884), and that of the 31st August, 1885, a copy of which is annexed.
4. The names of the Trustees will be found in the last-mentioned report (31st August, 1885).

REPORT to the present date from the date (31st December, 1883) to which the last Report recorded the operations of the Trust.*

The Chairman, National Park Trust, to The Secretary for Lands.

Sir, 31 August, 1885.

The Trustees† of the National Park have the honor to present to you their Report of the works effected since 31st December, 1883.

Road extension.

The formation of the road along the valley of Port Hacking River towards the southernmost boundary of the Park has been extended a further distance of 3 miles, to the bridge in course of construction across Bola Creek,—making the total distance completed 6 miles.

The work has been carried out under contract, and performed in a most satisfactory manner, notwithstanding the numerous heavy rock and shale excavations.

The bridges and culverts are very strongly built; they are of durable character and of sufficient capacity, and with strength sufficient to withstand the heaviest floods.

This road follows the windings of the river, and brings into view some of the most beautiful scenery of the Park. It will doubtless become a favourite drive and promenade. Just beyond Tāmūr Creek, on the opposite (the left-hand) side of the river, there are tall forest trees, over which vines climb and overhang; also, bangalo and cabbage-tree palms, fine specimens of bird's-nest ferns, tree ferns, &c.; intermixed are wild canes, which attain to 100 feet.

About 2 miles below Bola Creek (northerly therefrom) the Illawarra formation commences, and extends from thence upwards to the southernmost boundary of the Park; this accounts for the rich varied palm, fern, vine, and tree foliage.

About 1 mile south-westerly from Bola Creek Bridge there is a forest of magnificent timber as yet unassailed by the devastating hands of the woodman. Included in the forest are blackbutts of gigantic height, some measuring 22 feet in girth at the height of 5 feet from the ground; and turpentines, about 150 feet high, measuring 27 feet in girth at 5 feet from the ground. No forest within 100 miles of Sydney is comparable to it.

A contract has been arranged for road extension beyond the bridge over Bola Creek, and through the easterly margin of this forest, which will thus be made easily accessible for visitors to the Park.

New road.

A new road, with very easy gradients, has been made from the crossing, at 16 miles 30 chains from Sydney, of the Railway line over the main Illawarra Road, to the gate on the saddle below the southerly end of Loftus Heights, which will be the terminus in the Park of the Railway. The length of this road is 1¼ mile. The whole has been cleared, and the formation is nearly complete.

Shelter and accommodation for the public.

The necessity of providing shelter and accommodation for visitors to the Park, more especially at the time of the opening of the Railway, became so apparent that the Trustees unsuccessfully requested the Government to authorize them to transfer the expenditure of £1,200, voted for roads southerly in the Park, and for a bridge to cross Bola Creek, to defray the cost of providing the required shelter and accommodation. As the sum appropriated could not be legally transferred, the Trustees determined to make other arrangements.

A beautiful serpentine walk has been made, leading from the southern end of Loftus Heights, which will be the terminus of the Railway siding, to the salt-water part of the river, where boats will be kept for the accommodation of the public. The walk is continued up the left bank of the river, facilitating approach to the boats, which will be kept on the fresh water above the dam.

Land clearing at Loftus Heights.

The area of land cleared at Loftus Heights has been extended from 80 acres to upwards of 200 acres. This work has been done mainly under contract in areas from 5 to 20 acres. As in all similar work at the National Park, precaution has been exercised to preserve the best of the ornamental and all the good sheltering trees, all Christmas bushes, waratahs, gigantic lilies, &c.

Tree-planting.

During the past year progress has been made in planting ornamental trees obtained from the Government nurseries and from various contributors. Many of the trees are well established and thriving.

Deer park.

Among the latest and most attractive improvements is the partial clearing of a very picturesque area of about 160 acres for a deer park. This area is enclosed where necessary, and to the extent of ¾ mile, by a permanent 6-feet fence of 9 wires; the other boundaries, 2 miles in length, are Port Hacking River and its pretty inlets.

A considerable proportion of the area is well grassed, with a never-failing supply of pure fresh water, including the water of the brook, which terminates at "The Fountain," opposite Mangrove Island.

The under-scrubbing of the area is in progress.

Seven deer, a donation from the Trustees of Parramatta Park, are now running on this area, and doing well.

Park boundary fence.

After surmounting many difficulties, a contract was entered into, in October last, for the erection of a fence along that part of the boundary of the Park which extends from Woronora River to Port Hacking River. 1¾ mile of this fence is completed.

On

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* That Report is dated 26th May, 1884, and was presented to Parliament by the Honorable the Secretary for Lands, on Tuesday, 26th August, 1884.

† The Trustees of the Park now are:—

Honorable Sir John Robertson, K.C.M.G., M.P.,	appointed	26th April, 1879, Chairman.
Honorable Robert Wisdom, M.P.,	do.	do.
Angus Cameron, Esquire, M.P.,	do.	do.
Andrew Hardie McCulloch, Esquire, M.P.,	do.	do.
Joseph Graham, Esquire, J.P.,	do.	do.
Charles Moore, Esquire, F.L.S.,	do.	do.
Walter Bradley, Esquire,	do.	do.
George Frederick Want, Esquire,	do.	do.
Edmund Bingham Woodhouse, Esquire,	do.	12th December, 1879.
Honorable James Squire Farnell, M.P.,	do.	4th February, 1881.
John Williams, Esquire, J.P.,	do.	1st August, 1882.
James Patrick Garvan, Esquire, M.P.,	do.	14th November, 1884.

On application of the Park Trustees, the southerly shore of Port Hacking River, so far as it bounds the National Park, was, on 19th June, 1885, proclaimed a Public Oyster Reserve, and exempt from the power of leasing. Oyster lands abutting the National Park.

With a view to the advancement of oyster culture the Trustees have made arrangements to procure the best varieties from America.

In November, 1884, and at subsequent periods, the Trustees expended a sum of money for the introduction of English perch and other fresh-water fish. Acclimatisation of fresh-water fish.

In May last, by the kind co-operation of His Worship the Mayor and the City Clerk of Ballarat, and Officers of the Railway Departments of Victoria and New South Wales, a large number of live trout and English perch, from Ballarat, were successfully introduced into Port Hacking River, above the "Upper Peach Trees."

The river, perhaps the only one running from south to north between high and precipitous mountains, is shaded from the sun more than any other river in New South Wales known to the Trustees —hence the prospect of English fish thriving in it is the greater, owing to the cool temperature.

The training-walls erected in 1883 (incomplete though these were) along and partly across the worst sand-shoal flat in Port Hacking River, situate about ¾ mile below the dam, has resulted in considerably deepening of the channel at this part. Further expenditure will be required to make the work more completely effective. Training-walls below the dam.

The Trustees propose to carry out similar improvements in the future on the river, below the dam, near Audley, and they hope with equal or even greater beneficial results, so that the river throughout may become navigable for large boats at all times. Above the dam the river for 4 miles is constantly navigable for steam launches of moderate draught and large boats, as a result of the construction and maintenance of that structure. During the past four months this dam has been increased in height, so that it is now above the level of the highest king tides.

On 3rd October, 1884, a purchase at auction, at Messrs. Richardson & Wrench's Rooms, Pitt-street, Sydney, was effected (on behalf of the Government), of 60 acres, between Simpson's 50 acres and Lord's 20 acres, to afford for the Park a convenient approach to the high land at the back, and an additional desirable frontage to Port Hacking at a clear sandy beach. The price paid, equal to £7 6s. 8d. per acre, is undoubtedly very moderate. Land purchased for an approach near Cabbage-tree Creek.

The Trustees hope to be able to furnish with the next Report accurate maps, which are in course of compilation, to a sufficiently large scale to show clearly the various roads, structures, and improvements generally, as well as the natural features, &c. Maps to show positions of improvements, &c.

I have the honor to be,
Sir,
Your obedient servant,
JOHN ROBERTSON,
Chairman, National Park Trust.

SCHEDULE of Names adopted for Natural Features within the National Park since its dedication.

THE names "Fountain Brook" and "The Fountain," respectively, for the brook and the natural fountain within and close to the southerly boundary of the "Deer Park."

The name "Loftus Heights," in honor of His Excellency the Governor, for the high land between the Illawarra Railway, at about 16¾ miles from Sydney, and Port Hacking River, below the dam. This area is now cleared to the extent of 200 acres to afford sites for recreation and military encampment and review grounds; from it fine views are obtained of the ocean, Port Hacking, Botany Bay, Randwick, parts of Sydney, &c.

The name "Audley" has been adopted for the locality of the Main National Park Camp, at the confluence of Port Hacking River with Kangaroo Creek, in honor of Licensed Surveyor Lord Audley, who, in the year 1864, made the first accurate survey of Port Hacking River, and had his Main Survey Camp at the place.

The name "The Island" for the isolated high hill or mountain immediately southerly from the confluence of Port Hacking River and Bola Creek, and between those streams.

The names hereunder have been adopted for the brooks which flow to the right bank of Port Hacking River, and are crossed by the road formed through the valley of that river :—

Distance by road southerly from the Dam.	Name of Brook in the language of the Aborigines of Australia adopted.	In parentheses, the Meaning in the English Language of the Name
66 chains (about ¾ mile)	Mullion	(Eagle).
88 ,, (,, 1 ,,)	Warrūl	(Bee).
97 ,, (,, 1¼ ,,)	Burowa	(Bustard).
165 ,, (,, 2 miles)	Karoga	(White Crane).
192 ,, (,, 2½ ,,)	Gorra Worra	(Laughing Jackass).
211 ,, (,, 2¾ ,,)	Buralga	(Native Companion).
246 ,, (,, 3 ,,)	Kōbardō	(Parrot).
254 ,, (,, 3¼ ,,)	Birūmba	(Plover).
266 ,, (,, 3½ ,,)	Dirijiri	(Wagtail).
288 ,, (,, 3¾ ,,)	Murrindum	(Quail).
327 ,, (,, 4 ,,)	Dumbal	(Crow).
336 ,, (,, 4¼ ,,)	Tamūi	(Bronze-winged Pigeon).
356 ,, (,, 4½ ,,)	Burunda	(Swan).
366 ,, (,, 4⅝ ,,)	Karāni	(Duck)
425 ,, (,, 5¼ ,,)	Palona	(Hawk).

4

Schedule No. 2 to Second Report of National Park Trust.

Funds received since Dedication of Park.				£	s.	d.
To 31st Dec., 1883 (*vide* Schedule to first Report, dated 26th May, 1884, and presented to Parliament by the Hon. the Secretary for Lands, on 26th August, 1884) :—						
For general improvements	£7,500	0	0			
For clearing land and snagging ...	1,250	0	0			
For enclosing National Park* ...	1,500	0	0			
Subscriptions towards cost of dam below "Audley" (Hon. T. Holt, £100 ; Hon. Sir J. Robertson, £50 ; J. Lucas, Esq., £50 ; W. Bradley, Esq., £50)	250	0	0			
Other miscellaneous funds ...	209	11	0			
General total to 31st Dec. 1883 ...				10,709	11	0
Since 31st Dec., 1883, to 31st August, 1885 :—						
For general improvements :—						
Estimates-in-Chief, 1884 ...	£2,000	0	0			
Do. do. 1885 ...	2,000	0	0			
Bank of New Zealand, o/d. 31st Aug., 1885 ...	188	15	11			
Miscellaneous funds, availed of for general improvements :—						
C. Millar and E. Millar, for royalty at rate of 1s. 6d. per 1,000 on bricks made on National Park for Illawarra Railway purposes	22	10	0			
Sundry individuals — for callow bricks (presented to the National Park Trust by the Messrs. Millar), at rate of £2 per 1,000 ...	18	0	0			
Sundry individuals — occupation fees, National Park, in connection with Illawarra Railway works ...	60	8	0			
Messrs. Rowe & Smith, for royalty at rate of 1s. 6d. per 1,000, on bricks made on National Park for Illawarra Railway purposes..	16	7	9			
G. Kiss—net proceeds of sale of horse on account National Park Trust. ...	17	8	0			
				4,323	9	8
Special credit towards purchase of steam launch, &c. (received from the Treasury, 3rd June, 1884)				200	0	0
For completion of dam below "Audley,"—Supplementary Estimates, 1884 ...				500	0	0
For road from southerly end of road contract No. 5 to southernmost boundary of park, including bridge over Bola Creek, &c.—Estimates-in-Chief, 1885 ...				1,200	0	0
For dam across Port Hacking River, above "The Peach Trees"—Estimates-in-Chief, 1885 ...				300	0	0
General total to 31st August, 1885.. ...				17,233	0	8†
Unexpended balances, 31st August, 1885 :—						
Vote for completion of dam below "Audley"...	£316	11	6			
Vote for enclosing National Park ...	337	16	11			
Vote for dam across Port Hacking River above "The Peach Trees"...	300	0	0			
Vote for extension of road to southernmost boundary of National Park, and bridge over Bola Creek ..	1,200	0	0‡			
				2,154	8	5
Difference, being the total expenditure, 1st Oct., 1879, to 31st August, 1885 ...				15,078	12	3

Estimated value of improvements, boats, tools, appliances, &c., on 31st August, 1885.	£	s.	d.
Pavilion erected prior to 31st Dec., 1883, and since improved ...	200	0	0
Pavilion erected since 31st Dec., 1883...	300	0	0
Furniture and fittings in pavilions ...	100	0	0
Caretaker's cottage, with kitchen added since 1883	200	0	0
Cottages for working overseer, carpenter, and labourers ...	200	0	0
Stables, stores, and outhouses ...	200	0	0
Forge, smithy, tools, and plant ...	300	0	0
Dam below "Audley" ...	2,500	0	0
Training-wall, Port Hacking River, below dam below "Audley" ...	100	0	0
Boat-house and jetties ...	50	0	0
Slip, built of wood, with galvanized-iron roof, for repairing steam launch and boats ...	100	0	0
Dock, Port Hacking River, below dam below "Audley" ...	60	0	0
Steam launch ...	150	0	0
Boats and punts ...	150	0	0
Roads, bridges, and pathways ...	6,000	0	0
Clearing on flats near main camp, 10 acres ...	100	0	0
Clearing on Loftus Heights, 200 acres.. ...	1,050	0	0
Under-scrubbing within deer park, about 30 acres..	60	0	0
Fencing ...	300	0	0
Waggons and drays... ...	130	0	0
Horses... ...	80	0	0
Sundries, about... ...	270	0	0
Clearing snags from Port Hacking River and Kangaroo Creek ...	1,000	0	0§
Total estimated value to 31st Aug., 1885...	£13,600	0	0

* Under special authority of Parliament (item 339 of Appropriation Act of 1884). £1,000 of this sum has been expended for general improvements.
† Caretaking, maintenance of roads, &c., have been covered by this sum since October, 1879.
‡ Memo.—31st August, 1885, estimated liability on contract for bridge over Bola Creek and road half a mile beyond, £371 16s.
§ Inadvertently omitted from Schedule.

Sydney : Thomas Richards, Government Printer.—1886.

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

WILBERFORCE COMMON.

(PETITION, CERTAIN TRUSTEES FOR—AND RESIDENTS OF WILBERFORCE.)

Ordered by the Legislative Assembly, to be printed, 3 August, 1886.

To the Honorable the Speaker and Members of the Legislative Assembly.

The humble Petition of the undersigned Trustees for the Wilberforce Common, and residents of Wilberforce, and the neighbourhood, having a right of commonage thereto,—

RESPECTFULLY SHOWETH:—

That the proposed sale of certain portions of the Wilberforce Common, amounting to 5,390 acres, as announced in the *Government Gazette* of date 9th July, 1886, would, if carried into effect, be highly prejudical to your Petitioners, for the reasons set forth below, viz.,—

(1.) That the said Common has been since the date of the grant thereof, in the year A.D. 1804, and is now a great boon to the inhabitants of Wilberforce, and those having right thereto as a run for their stock, the procuring of firewood, and fencing building material, a place of refuge in flood time for their horses and cattle, and for other good purposes.

(2.) That the Trustees have a code of by-laws for the management of the Common, which were adopted at a public meeting of the commoners, and sanctioned by the Attorney-General, whereby the Trustees were enabled to have the Common nearly fenced in at a considerable cost, thus adding to its usefulness.

(3.) That the portions if sold as proposed would render the remainder of very little avail for the purposes for which the Common was granted, about a square mile thereof being very barren and scrubby; in fact during times of drought the whole of the Common is barely sufficient for the support of the stock entitled to be run thereon.

(4.) That the sale as proposed would not be the means of settlement or of public benefit, as your Petitioners have good reason to believe that land speculators would be the chief buyers.

(5.) That the consequence of the portions being sold would most likely lead to impounding of stock and vexatious actions for trespass or otherwise, and moreover purchasers who may reside on and improve their purchases would claim a right of commonage, which if not granted to them they would perhaps so dog the stock off the portion reserved as to render it practically useless.

Your Petitioners therefore humbly pray that this their Petition may receive your favourable consideration, and that your Honorable House will not sanction the resumption and sale as proposed.

And your Petitioners will ever pray.

[*Here follow* 80 *signatures.*]

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

RESERVES, GLEN INNES LAND DISTRICT.

(NUMBER, AREA, AND NAME OF RUN OF WHICH SITUATE.)

Ordered by the Legislative Assembly to be printed, 25 March, 1886.

RETURN to an *Order* made by the Honorable the Legislative Assembly of New South Wales, dated 24th September, 1885, That there be laid upon the Table of this House,—

"A Return showing the Reserves within the Glen Innes Land District, the "official number, the area of each, the name of run on which situate, and "the objects for which each Reserve was made."

(Mr. W. J. Fergusson.)

RETURN showing Reserves from Sale in the Land District of Glen Innes.

No.	Purpose.	Area in Acres.	Parish.	County.	Holding.	Leasehold or Resumed Area.
2	Forest	3,000	Capoompela	Clive	Glen Elgin	Resumed
3	Do	1,280	do	do	Part Bolivia and Glen Elgin	do
26A	Water	640	Kaloe	Gresham	Newbold Grange	do
61	Village	800	Newton Boyd	Gough	Newton Boyd	do
63	Do	1,440	do	do	do	Leasehold.
72	Water	640	Strathbogie	do	Strathbogie	Resumed.
72 extn.	Do	320	do	do	do	do
72 extn.	Do	5	do	do	do	do
77	Do	640	Urania	Gresham	Newton Boyd	Leasehold.
90	Do	640	Waterloo	Gough	Waterloo	Resumed.
90 E. extn.	Do	500	Waterloo and Clifton	do	do	do
90 W. extn.	Do	600	Waterloo	do	do	Leasehold.
92	Do	160	do	do	do	do
120	Do	640	Fladbury	do	Ranger's Valley	do
163	Do	320	Springbrook	do	Broadmeadows	Resumed
235	Do	150	Kaloe	Gresham	Newbold Grange	Leasehold.
236	Do	320	do	do	do	do
221	Racecourse	216	Stonehenge	Gough	Ranger's Valley	Resumed.
237	Water	40	Wellington	do	Wellingrove	do
241	Do	40	do	do	do	do
242	Road	80	Dichard	do	Newton Boyd	do
243	Do	324	Henry	Gresham	do	Leasehold.
263	Traffic	960	Ditmas and Waterloo	Gough	Newton Boyd, Invercll, and Clarevaulx.	Resumed and leasehold.
263A	Travelling stock	1,000	Cowan, Wellington, and Barool	Gresham	Cunglebung	Leasehold and resumed.
277	Water and camping	160	Wellington	Gough	Clarevaulx	Leasehold.
283	Water	222	Ranger's Valley	do	Ranger's Valley	do
284	Do	60	On Vegetable Creek, Strathbogie Run.	do	Strathbogie	Resumed
330	Village	320	Ranger's Valley	do	Blair's Hill	do
337	Travelling stock	1,000	Ditmas	do	King's Plains, Clarevaulx, and Wellingrove.	Leasehold and resumed
337 extn.	Do	11½	do	do	do	do
337 extn.	Do	405	do	do	Wellingrove	do
336	Water	16½	Mitchell	do	Mt. Mitchell	Leasehold.
345	Do	6¾	do	do	Shannon Vale	do
349	Do	4	Worra	Gresham	Mt. Mitchell	Resumed.
351	Do	10	Beardy Plains	Gough	Shannon Vale	do
352	Do	4½	Scone	do	Strathbogie	do

[805 copies—Approximate cost of Printing (labour and material), £18 17s. 9d.]

No.	Purpose.	Area in Acres.	Parish.	County.	Holding.	Leasehold or Resumed Area.
355	Sluicing	18	Boyd	Gough	Ranger's Valley	Resumed.
358	Water	7	Mitchell	do	Shannon Vale	Leasehold.
370	Travelling stock	2,000	Yarrowford, Boyd, and Severn.	do	Ranger's Valley	Resumed.
371	Do	668	Boyd	do	do	do
375	Do	3,000	Ben Lomond, Fletcher, and Stonehenge	do	Ben Lomond Marowan Stonehenge	do Leasehold. Resumed.
375 extn.	Do	27	Ben Lomond	do	Marowan	Leasehold and resumed.
387	Do	284	Fletcher, Beardy Plains, and Stonehenge	do	Ranger's Valley Blair Hill Stonehenge	Resumed. Leasehold. Resumed
388	Do	182	Wellingrove	do	Wellingrove	do
419	Road, crossing, and camping.	484	Glen Innes and Beardy Plains	do	Ranger's Valley	do
423	Water	640	Gordon	do	Wellingrove	Leasehold.
423 extn.	Do	130	do	do	do	do
494	Do	640	Urania and Henry	do	Newton Boyd	do
495	Do	640	do do	do	do	do
502	Travelling stock	123	Ben Lomond	do	Marowan	do
521	Do	544	Stonehenge	do	Blair Hill	do
531	Camping	92	Severn	do	Ranger's Valley	do
563	Water	744	Wellington	do	Clarevaulx	do
564	Do	100	Yarrowford and Wellington	do	do	do
565	Do	930	Wellingrove	do	Waterloo	do
584 extn.	Camping	520	Rusden	do	Shannon Vale	Resumed.
684 extn.	Village	160	do	do	do	do
585	Camping and village	920	Ditmas	do	Clarevaulx	Leasehold.
644	Temporary common extension.	1,900	Clifton	do	Glen Innes (Town district)	Resumed.
655	Water	670	Wellington	do	Clarevaulx	Leasehold.
671	Water and camping	700	Bald Nob	do	Ranger's Valley	Resumed.
681	Travelling stock	1,500	Boyd, Beardy Plains, Shannon Vale.	do	Blair Hill, Ranger's Valley	Leasehold and Resumed.
681 extn.	Do	50	Beardy Plains	do	Ranger's Valley	Resumed.
712	Water	1,200	Ranger's Valley	do	do	Leasehold
728	Recreation	130	Town of Glen Innes	do	Glen Innes (Town)	Resumed.
732	Camping	640	Mann and Robertson	do	Newton Boyd	do
739	Water	320	Gordon	do	Wellingrove	Leasehold.
739 extn.	Do	400	do	do	do	do
740	Do	1,000	Wellington	do	do	Resumed.
742	Do	350	Kingsgate	do	Shannon Vale & Yarrow Creek	do
746	Forest	24,320	Yarrowford, Boyd, Louis, and Wellington.	do	Ranger's Valley	Leasehold.
746 extn.	Do	130	Yarraford	do	do	do
747	Water and camping	320	Ranger's Valley and Louis	do	do	do
748	Water	19	do do	do	do	do
763	Do	280	Stonehenge and Beardy Plains	do	Blair Hill	do
764	Do	800	do and Fletcher	do	do	do
765	Do	600	Stonehenge	do	do Stonehenge	Leasehold Resumed.
766	Do	280	Clifton	do	Glen Innes (Town)	do
767	Public purposes	20	Glen Innes	do	do do	do
768	Village	93¾	Fletcher	do	Stonehenge	do
776	Road metal	110	Stonehenge	do	Glen Innes (Town)	do
777	Camping	320	Rusden	do	Shannon Vale	do
778	Public purposes	300	do	do	do	do
779	Water	720	Mount Mitchell	do	Yarrow Creek and Mt. Mitchell	Leasehold
782	Do	620	Yarrow	do	Yarrow Creek	do
783	Do	1,700	do	do	do	do
784	Do	300	Ditmas	do	Clarevaulx	do
785	Do	800	Brothers	do	Yarrow Creek	Resumed.
787	Do	640	Blair Hill and Marowan	do	Blair Hill	do
788	Do	340	Marowan	do	Marowan	Leasehold.
789	Do	800	Waterloo	do	Waterloo	Resumed.
790	Do	200	do	do	do	do
790 extn.	Do	50	do	do	do	do
791	Do	560	Kingsgate	do	Yarrow Creek	do
793	Do	460	Waterloo and Clifton	do	Waterloo	do
794	Do	500	do do	do	do	Leasehold.
794A	Water and travelling stock.	58	Waterloo	do	do	do
810	Travelling stock	2,600	Robertson, Bald Nob, Bloxsome, and Gibraltar	do and Clive	Ranger's Valley Glen Elgin Newton Boyd	Resumed. Leasehold. Resumed.
811	Water	300	Llangothlin	do	Marowan	Leasehold.
813	Travelling stock	600	Severn	do	Ranger's Valley	Resumed.
814	Water	260	Wellington and Wellingrove	do	Wellingrove	do
*815	Do	610	Boyd	do	Shannon Vale	do
815 extn.	Do	46	do	do	do	do
817	Do	140	Yarrowford	do	Clarevaulx	Leasehold and Resumed.
818	Do	640	Rusden	do	Shannon Vale	Resumed.
822	Do	105	Wellingrove	do	Wellingrove	do
*814A	Public purposes	235	Boyd	do	Shannon Vale	do
824	Water	980	Fletcher	do	Marowan and Stonehenge	Leasehold and Resumed.
833B	Mining	10,000	Strathbogie and Scone	do	Strathbogie	Leasehold.
834	Camping	1,280	Robertson and Mann	do	Newton Boyd	Resumed.
839	Water	63	Severn	do	Ranger's Valley	do
846	Public purposes	8½	Rusden	do	Shannon Vale	do
847	Do	6½	do	do	do	do
848A	Water	3½	do	do	do	do
872	Do	640	Blair Hill	do	Blair Hill	Leasehold.
873	Do	1½	Wellington	do	Clarevaulx	do
923	Public purposes	80	Boyd	do	Shannon Vale	do
924A	Do	980	Mount Mitchell	do	Mount Mitchell	do
942	Railway	10	Glen Innes	do	No holding	Resumed.
943	Do	10	do	do	do	do
946	Water	20	Yarrowford	do	Clarevaulx	Leasehold.
951	Do	135	Stonehenge	do	Stonehenge	Resumed.
954	Do	150	Louis	do	Ranger's Valley	Leasehold.
973	Do	640	Ben Lomond	do	Stonehenge	Resumed.
974	Camping and public purposes.	300	Blair Hill	do	Yarrow Creek	Leasehold.
984	Crossing	1a 2r 20p	Rusden	do	Shannon Vale	Resumed.
986	Water	189	Scott	do	Ranger's Valley	do
987	Do	500	do	do	do	do
988	Do	65	Gordon	do	Wellingrove	Leasehold.
1033	Do	220	Clifton and Fletcher	do	Glen Innes (Town)	Resumed.
1047	Travelling stock	400	Broadmeadows, Marengo, and Glen Innes.	Gresham	Broadmeadows	do
1069	Water	440	Henry	do	Newton Boyd	Leasehold.
1071	Camping	250	Llangothlin	Gough	Ben Lomond	do
1085	Forest	385	Mount Mitchell	do	do	do
1086	Water	280	do	do	Mount Mitchell	do
1101	Public purposes	150	Gordon	do	Wellingrove	do
1106	Water	640	Kingsgate	do	Yarrow Creek	Resumed.

No.	Purpose.	Area in Acres.	Parish.	County.	Holding.	Leasehold or Resumed Area
1130	Water	580	Worra	Gresham	Mount Mitchell	Leasehold.
1131	Do	640	do	do	do	do
1136	Camping	41	Scott	Gough	Ranger's Valley	Resumed.
1159	Water and camping	100	Fladbury	do	do	Leasehold.
1160	Water	200	do	do	Wellingrove	Resumed.
1165	Do	640	Moogem	Clive	Rocky River	do
1167	Camping	90	Ditmas	Gough	Clarevaulx	Leasehold.
1172	Water	280	Wellington	do	Wellingrove	Resumed.
1173	Public purposes	3	Stonehenge	do	Glen Innes (Town)	do
1174	Camping and public purposes	5	Fletcher	do	Stonehenge	do
1182	Recreation	20	Wellingrove	do	Wellingrove	do
1183	Water	20	do	do	do	do
1195	Do	195	Glen Innes	do	No holding	do
1198	Public school	20	Fletcher	do	Stonehenge	do
1199	Water, &c.	22	Glen Innes	do	Glen Innes (Town)	do
1200	Water	51½	do	do	No holding	do
1213	Do	610	Ben Lomond	do	Marowan	do
1217	Do	100	Scott	do	Ranger's Valley	do
*1220	Do	275	Moogem	Clive	Rocky River	do
1233	Do	40	Ditmas	Gough	Wellingrove	do
1233 extn	Do	260	Glen Innes	do	Glen Innes (Town)	do
1239	Do	960	Rusden	do	do do	do
*1226A	Do and camping	85	Scone	do	Strathbogie	do
1240	Public School	8¾	Waterloo	do	Waterloo	do
1250	Water	115	Ben Lomond	do	Marowan	do
1262	Do	485	do	do	do	Leasehold.
1263	Public park	200	Glen Innes	do	Glen Innes (Town)	Resumed.
1273	Water and camping	350	Macintyre	do	Waterloo	do
1274	Water	320	do	do	Stonehenge	Leasehold.
1275	Camping	50	Newstead	do	do	do
1276	Railway	7¾	Stonehenge	do	Newstead	do
1285	Camping and access	380	Blair Hill	do	Stonehenge	Resumed.
1312	Public purposes	29½	Ben Lomond	do	Yarrow Creek	Leasehold.
1321	Camping	80	Bald Nob and Boyd	do	Marowan	Resumed.
1340	Public School	20	Beardy Plains	do	Ranger's Valley	do
1341	Travelling stock	390	Glen Innes	do	Shannon Vale	do
1342	Water	46	do	do	Glen Innes (Town)	do
1346	Camping	650	Scone	do	do do	do
1347	Water	257	Fletcher	do	Ranger's Valley	Leasehold and Resumed.
*1349	Bridge	46	Scone	do	Marowan	Leasehold.
*1348	Gibraltar (camping)	640	Gibraltar	Clive	Ranger's Valley	do
1355	Crossing and camping	13	Beardy Plains	Gough	Mole River	do
1355	Water	320	Farnell	Clive	Shannon Vale	Resumed.
1358	Trigonometrical	240	Worra	Gresham	Glen Elgin	do
1360	Railway	2	Glen Innes	Gough	Mount Mitchell West	Leasehold
1361	Do	14	do	do	Glen Innes (Town)	Resumed.
1362	Water reserve	720	Butterleaf	Clive	do do	do
1363	Do	640	Glen Elgin	do	Glen Elgin	Leasehold.
1364	Do	160	Capoompeta	do	do	do
1365	Do	640	Butterleaf	do	do	Resumed.
1366	Do	480	Cacoompeta	do	do	do
1367	Do	640	Farnell	do	do	do
1368	Do	400	Butterleaf	do	do	do
1389	Camping	130	Ranger's Valley	Gough	do	Leasehold.
1405	Public School	18	Tent Hill	do	Ranger's Valley	do
1406	Do	20	Yarrowford	do	Wellington Vale, Deepwater	do
1410	Special Lease	1 r. 8 p.	Ben Lomond	do	Clarevaulx	Resumed.
1412	Camping	180	Boyd	do	Marowan	do
1420	Do	95	Beardy Plains	do	Ranger's Valley	do
1421	Do	65	do	do	do	do
1433	Forest	12,800	Robertson	do	do	do
1448	Do	10,000	Parkes and Scott	do	Glen Elgin	Leasehold.
1485	Camping	160	Kingsgate	do	Ranger's Valley	Resumed.
1491	Camping and crossing	40	Beardy Plains	do	Yarrow Creek	do
1499	Camping	730	Gordon	do	Shannon Vale	do
1500	Water reserve	200	do	do	Wellingrove	Leasehold.
1508	Public buildings, &c	2	Glen Innes	do	do	Resumed.
1509	Water	2½	do	do	Glen Innes (Town)	do
1510	Public buildings, &c.	1	do	do	do do	do
1511	Do do	1	do	do	do do	do
1524	Public School	20¾	Scott	do	do do	do
1530	Water and camping	175¾	Ben Lomond	do	Ranger's Valley	do
1532	Camping and access	300	Ben Lomond, Kyandra, and Moredun.	do	Ben Lomond	do
1538	Camping	150	Beardy Plains	do	Shannon Vale	do
1539	Do	70	do	do	do	do
1541	Trigonometrical	59	Ben Lomond	do	Marowan	do
1542	Forest	6,400	Urania and Springbrook	Clive	Newton Boyd	Leasehold.
1543	Water	1,280	Wellington and Pahoi	Drake, Gresham	Broadmeadows	Resumed.
1544	Do	1,000	Cowan and Cangi	do do	Coomldooral	do
1545	Do	320	do do	do do	do	do
1547	Do	800	Urania and Barool	Gresham	do	do
1548	Do	700	Cowan	do	Cunglebung	do
1557	Camping	400	Scone	do	do	Leasehold.
1573	Extension to Cemetery	22	In Glen Innes	do	Ranger's Valley	do
1580	Railway reserve	19,200	Ditmas and Waterloo	do	Glen Innes (Town)	Resumed.
1582	Public School	22	Fladbury	do	Newstead	Leasehold and Resumed.
1584	Camping	640	Fletcher	do	Ranger's Valley	Leasehold.
1585	Village	640	Moogem	Clive	Stonehenge	do
1581A	Public buildings	7½	Boyd and Bloxsome	Gough	Rocky River	Resumed.
1598	Camping	640	Binny and Moogem	Clive	Ranger's Valley	do
1600	Crossing	12	Stonehenge	Gough	Rocky River	do
1605	Road Approaches	1½	Ben Lomond	do	Blair Hill	Leasehold.
1606	Yards	2	do	do	Marowan	Resumed
1608	Forest	24,960	Urania, Springbrook, and Barool	Gresham	do	do
1622	Camping	6	At Glen Innes	Gough	Cunglebung	Leasehold and Resumed.
1623	Water and camping	9½	do	do	Glen Innes (Town)	Resumed.
1627	Public School	10	Louis	do	do do	do
1632	Travelling stock	700	Boyd and Yarrowford	do	Ranger's Valley	Leasehold.
1634	Camping	112	Stonehenge	do	Glen Innes (Town)	Resumed.
1675A	Travelling stock	810	Boyd and Bloxsome	do	Stonehenge	do
1687	Railway	18	Ben Lomond	do	Ranger's Valley	do
1692	Village	1,000	Yarrowford	do	Marowan	do
1639	Public buildings	2½	Village of Severn	do	Glen Innes (Town)	do
1680	Recreation	4½	do	do	Ranger's Valley	do
1697	Railway	3 r. 13 p.	do	do	do	do
1640	Public buildings	3	do	do	do	do
1641	Police paddock	3½	do	do	do	do
1642	Water	15	do	do	do	do
1648	Public buildings	8	do	do	do	do
1644	Recreation	5	do	do	do	do
1645	Public buildings	4	do	do	do	do

4

No.	Purpose.	Area in Acres.	Parish.	County.	Holding.	Leasehold or Resumed Areas.
1646	Public buildings	120	Village of Severn	Gough	Ranger's Valley	Resumed.
1648	School paddock.....	9¾	Beardy Plains.....	do	do	do
1690	Railway	64,000	(Kingsgate, Brothers, Mann, Robertson, Rusden, Yarrowford, Boyd, Mitchell, Bald Nob, Diehard.)	do	Newton Boyd, Shannon Vale	Leasehold and Resumed.
			Cangi, Puhoi, Cowan, Wellington.	Drake.		
			Barool and Urania	Gresham.		
	Gold-field reserve from C.P.	6,400	Nullama	do		
	Do do	3,840	Marengo and Mount Ross	do and Clarke.		
	Do do	32,000	Cangi	Drake.		

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1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

RESERVES, MARRAR RUN, AND COUNTY OF MITCHELL.

(CORRESPONDENCE.)

Ordered by the Legislative Assembly to be printed, 11 *June*, 1886.

RETURN to an *Order* made by the Honorable the Legislative Assembly of New South Wales, dated 30th April, 1886, That there be laid upon the Table of this House,—

"Copies of all reports, minutes, and papers having reference to a Reserve "on the Marrar Run, and situated on the Railway line between Junee and "Marrar Platform, such Reserve having been withdrawn from sale on or "about the 18th March; and copies of all reports, minutes, and papers "having reference to a Reserve in the county of Mitchell, parish of "Brewarrina, proclaimed a special area on the 6th of April."

(*Mr. Gormly.*)

SCHEDULE.

578—A

[805 copies—Approximate Cost of Printing (labour and material), £31 19s. 3d.]

RESERVES, MARRAR RUN, AND COUNTY OF MITCHELL.

Copies of all reports, minutes, and papers having reference to a reserve on the Marrar Run, and situated on the railway line between Junee and Marrar platform, such reserve having been withdrawn from sale on the 23rd March, 1886.

No. 1.

Mr. District Surveyor Bolton to The Surveyor-General.

Sir, District Surveyor's Office, Wagga Wagga, 29 March, 1881.

I beg to acknowledge the receipt of your letter of the 29th December, 1881, No. 542, directing me to report on the locality in each county in my district in which I would advise the survey of land in anticipation of demand; and, in reply, I now do myself the honor to forward a sketch herewith showing certain land in the county of Bourke that I would recommend to be measured for alienation.

There appears to be no reason why the reserves embraced in the tract proposed to be measured should not now be revoked and alienated. The land indicated by green edging adjacent to the intersection of the railway with Murrulebale Road should be retained by the Crown for the present.

I have, &c.,
C. F. BOLTON, D.S.

No. 2.

Mr. Licensed Surveyor Commins to The Surveyor-General.

Sir, Wagga Wagga, 21 October, 1881.

In accordance with instructions received from District Surveyor C. F. Bolton, I have the honor to transmit herewith plan of portions 100 to 114, in the parish of Kinibilah, county of Bourke.

The wire fence on portions 103 and 104 is the run boundary, and belongs to the owners of Junee and Marrar Runs.

The fence on the west side of portions 111 and 113 belongs to D. Robertson; the value is stated on the plan.

The character of the soil is good throughout, but there is no water, and that can only be secured by tanks.

I believe all the land will be conditionally purchased when the reserve is revoked.

Discrepancies exist between my work and Mr. B. C. Garland's in every portion.

On the plan of portion 91, Mr. Garland represents the azimuth of No. 70, 5′ lower than 91; I find it higher.

The south side of 101 is the south side of No. 70, produced, and according to Mr. Garland's work it ought to read 89° 48′, and the east side of No. 70 ought to read the same, plus 90°; I represent it 359° 57′ or 9′ more.

Mr. Garland represents portion 96 parallel to the railway—I find it 8′ different.

I believe I can prove my work correct by the plans already in the office; all my work to the north, south, and east is measured on or reduced to one azimuth. Portion 100, parish of Gwynne (*vide* tracing herewith, or my plan 81-162) was measured on the azimuth of the portions lying east of it; and all the surveys in the parish of Gwynne are on the same azimuth which was laid out by the line which is a continuation of the west side of reserve Nos. 256 and 552 (on C. 1,463 roll); that line is represented 0° 1′, therefore the azimuth of C. 1,463 is 1′ higher than the surveys north of No. 100, and on C. 1,463 No. 3 is represented 359° 56′—and by referring to my plans of portion 110, 111, 113, parish of Gwynne, it will be seen that Robertson's C.P. (same azimuth as No. 3) are represented 359° 55′ or 5′ lower than Fox's C.P. No. 100, which is exactly the same as on C. 1,463 (359° 56′ and 0° 1′). On C. 1,463, portions 3, 2, 41, 81, 82, and 83, are represented 89° 52′; they are the same on my plan (81-162 herewith) portion 31, being 90, portions 86, 87, 92, 90, and 91, same azimuth portions 106, 107, 108, and 109, same azimuth reading 1′ in the survey herewith. I produced the west side of No. 107 north, and continued the same straight line to portion 96, and I found the azimuth of No. 109 (same as 110, 111, 113, &c., before referred to) to be 359° 55′, or "exactly" the same as it had been given before on the plans of 110, 111, 112, and 113. Thus I have worked over a great many miles, sent in the work at long intervals, and it closes perfectly. It will be observed that the chaining is fixed on the north and south, and if the long line was even one minute out it would not close.

All the foregoing will be more easily understood by reading it in connection with my plan 81-162; but, as that plan does not clash with Mr. Garland's work, I had to explain it in this letter.

The country being all alike the usual form will not be required; the distance from Wagga Wagga is about 20 miles, from Junee railway station about 5 miles.

Timber, worthless box; soil, good; no water; thick wattle scrub everywhere.

I have, &c.,
GEORGE W. COMMINS,
Licensed Surveyor.

Minutes

Minutes on No. 2.

Forwarded to the Surveyor-General, 27th October, 1881.—I have retained a copy of this letter, and will investigate the differences which occur between Messrs. Commins' and Garland's work. I would now recommend that the reserves embraced by these measurements be revoked and the land alienated. Mr. Commins having worked at great disadvantage from absence of grass and water for many months, I did not exact any reduction from the scale of fees for this survey.

C. F. BOLTON, D.S.

[*Enclosure.*]

Mr. Commins' letter, 81-163.

Number of portion.	Distance from nearest township and Land Office.	Water supply.	Timber and physical character of country.
100 to 114	20 miles from Wagga Wagga...	No water	All very scrubby; box forest worthless timber; granite formation; good red soil.

Junee Railway Station. Village and Post Office—about six.

This description of land is very meagre, and not to the point. Mr. Commins will be cautioned to be more precise in future.

Where hills are shown the country is undulating, and out-crops of granite occur. The remainder is comparatively open box forest, suitable for wheat-growing and grape vines. The timber very inferior in quality for building material, but excellent for fuel. There is no undergrowth of small wattles.

C. F. BOLTON,
District Surveyor.

No. 3.

Charting Branch.

Memorandum of subjects requiring explanation or completion in connection with the survey and plan of 15 portions Nos. 100 to 114 inclusive, parish of Kinilibah, county of Bourke, transmitted by Mr. Licensed Surveyor Commins' letter, No. 163, of 21st October, 1881. Instructions issued by Mr. District Surveyor Bolton, and on which Mr. Commins' report in explanation is required.

Subject:—

The county boundary, as shown on the above plan, along the eastern sides of portions 100 to 104, 109, 110, and 112 is incorrect; the boundary, as surveyed by Mr. Licensed Surveyor R. M'Donald, and shown in blue on tracing attached, is that adopted, and must be adhered to. There is also a discrepancy in the position of the range forming such boundary.

A connection should have been made with some of the marked trees on the boundary line.

The observations for the true meridian required by paragraph 34 of general instructions have not been supplied either on the above plan or that of the adjoining subdivision on the east.

P.F.A.

9th January.

Report:—

Licensed Surveyor M'Donald did not make a survey of the county boundary; he merely made a flying traverse of country claimed by Mr. M'Donnell, lessee of the Murrulebale Run. I am positive the range is correct on my plan, and if the blue line is adopted as the county boundary, it will not fit with the range.

I could not find any trees * * As stated above, it was not a survey of the county boundary, merely a private traverse. I determined the true meridian in several places on the adjoining work, and it was unnecessary to take it again, especially as I have verified its accuracy with connecting surveys on which observations had been taken many miles apart and close to a few seconds (14).

Full information was sent on a separate sheet for the surveys on the east; it was not given on plans, and payment was refused in consequence, and I had to supply it before I was paid.

GEO. W. COMMINS.

Minutes on above.

Chief Draftsman,—It is presumed the range, must continue to form the county boundary, as it forms the eastern boundary of the Bourke, Cooper, Dowling, and Gipps Gold-field, which latter boundary is described as being coincident with the county boundary.—G.P., February 10/82.

No. 4.

Memorandum from Mr. District Surveyor Twynam to Mr. District Surveyor Bolton.

It is preferable, for many reasons, that prominent natural features, such as ranges and rivers, should be adopted as county boundaries, wherever in other respects suitable; and, in this instance, such a low range separates the counties Clarendon and Bourke, and as such has been properly made or available for the boundary of the Bourke, Cooper, Dowling, and Gipps Gold-field.

The subdivision is not in accordance with the design prepared by the District Surveyor, and approved, and it must be amended accordingly, defining the county boundary, being the summit of the low range of hills; and if the conditions be suitable, a road 150 feet wide might be designed separating the portions on each side.

If either of the trees on run survey—box over 71, box over broad-arrow, box broad-arrow over M—be extant, connections should be measured to either or all of them. Mr. M'Donald's survey does not exactly follow the summit of the low range or division of the water-sheds, but to a great extent is a traverse of a then standing fence, adopted as a boundary by mutual arrangement.

The District Surveyor will be in a position to decide whether the road separating portions 112 and 117, &c., so nearly accords with the natural boundary as to warrant its adoption, which appears to be expedient; and he will also give special instructions as to the extent and particulars of amendment of boundaries, and effacement of the marked lines not utilized.

To

To the District Surveyor at Wagga Wagga, who will be so good as to cause amendment of survey under the above minute as soon as possible. I think the amendment should be effected by Mr. Licensed Surveyor Commins without delay, so as to avoid complication by conditional purchase. I may also add that if the matter had come under my notice sooner the usual advance on account would have been withheld pending amendment.

(For the Surveror-General),
E. TWYNAM,
7 March, 1882.

B.C., Mr. Bolton, District Surveyor.

Minute on No. 4.

Mr. Licensed Surveyor Commins,—To make the required alterations as indicated, more particularly in pencil on sketch attached to memo. form within.—C. F. Bolton, D.S., 27 July, /82.

No. 5.

Mr. Licensed Surveyor Commins to The Surveyor-General.

Wagga Wagga, 9 August, 1882.

Sir,

In accordance with your letter of instructions B.C. 82-109 of 7th March, issued to District Surveyor C. F. Bolton, and transferred to me on the 27th July, I have the honor to transmit herewith, plan of portions 157, 158, 162, and 167, parish of Maror, county of Clarendon, and portions 109, 116, and 117, parish of Kinilibah, county of Bourke.

The plan is only intended to supply information which can be put on the originals, in order that the work may be kept together.

I have not sent an account, as I suppose the alterations will be applied to the original plans, and the accounts altered accordingly.

The references to all corners are not given, partly because they are on the original plans, and partly because I have not got my field-book here. District Surveyor Bolton asked me to make the survey as speedily as possible, and I did so on the first fine day after receiving the instructions, and send the plan with such information as I have at hand.

The numbers on the original trees have been altered to correspond.

I could not find the old trees to which connections were required, and such connections are unnecessary now, as all the county boundary has been resurveyed by me in the measurement of portions.

I have, &c.,
GEO. W. COMMINS,
Licensed Surveyor.

Minutes on No. 5.

Forwarded to the Surveyor-General, 15 August, 1882.—If Mr. Commins' original plans were transfer lithographed instead of photo-lithographed, the alterations could be on the lithograph so as not to be apparent.—C. F. Bolton, D.S.

Memo to L. S. Commins, asking whether a road has been marked along each side of the railway line—20 Feb, 1883.—R.H.C.

Mr. G. Lewis.—Then to Mr. Blake for auction sale.—W. D. Armstrong, 9 March, 1883.

Mr. Commins should probably have shown the trial line of railway (from which reserve 218 acres was described).

No. 6.

Memorandum from Surveyor-General to Under Secretary for Lands.

Out of the 2,324 acres measured as shown on plan B. 850-1,806, counties of Bourke and Clarendon, papers enclosed, 2,188½ acres are included within the following reserves, viz. :—Railway reserves 218ac, 218ac. extension, 1847, and reserve No. 665 for water supply. It is submitted for the consideration of the Secretary for Lands whether the cancellation of these reserves be proceeded with pending legislation. The only improvement is fencing, in no case reaching £40 on a measured portion.

G. LEWIS,
(For Surveyor-General).

19 April, 1883.

Minutes on above.

Submitted that action be stayed for the present.—F.H.W., 25/4/83. C.O., 27/4/83. Approved.—J.S.F., 28 April, 1883. For the information of Survey Office.—J.D.D. (*pro.* F. H. Wilson), 28/4/83. Mr. G. Lewis,—Is the land within a resumed or leasehold area?—C.O., 29/10/85. Mr. Houston—J.E., 31/10/85.

Portions in county of Bourke are within resumed area, Marrar Holding, No. 16, Central Division, gazetted 11 July, 1885; and portions in county Clarendon are within resumed area, Junee Holding, No. 147, Central Division, gazetted 11 July, 1885.—C.J.S., 5/11/85. Mr. Edwards. Submitted.—Whether the reserve be cancelled—R.H.D., 14/11/85. C.O., 16/11/85. Approved.—J.P.A., 20/11/85 Mr. Geo. Lewis.—R.H.D., 21/11/85.

No. 7.

Memorandum from Surveyor-General to Under Secretary for Lands.

Descriptions are enclosed for the cancellation of part of water reserve 665, R.R. 218a. R.R. 218a. extension, and R.R. 1847, in the parishes of Kinilibah and Maror, counties of Bourke and Clarendon, in accordance with Ministerial approval.

G. LEWIS,
(For the Surveyor-General).

10 Dec., 1885.

Minutes on above.

Mr. Gerard will please state if this description is included within the leasehold or resumed area of any holding.—For G.L., W.H.H., 14/1/86. Situated partly within the resumed area of Junee Holding and resumed area of Marrar Holding.—F.G., 16/1/86. Erased from map, plan noted, and Land Agent informed.—W.D.L., 8/2/86.

No. 8.

No. 8.

Executive Council Minute.

Recommending the revocation of Reserves from Sale.

Department of Lands, Sydney, 29 December, 1885.

It is recommended to His Excellency the Governor and the Executive Council that the temporary reservation from sale of the portions of land within described and particularised in the annexed Schedule be now revoked, under the provisions of the Crown Lands Act of 1884—the revocation to take effect at the expiration of sixty clear days from the date of notification thereof in the Government Gazette.

GERALD SPRING.

SCHEDULE.

Registration Number.	No. of Reserve.	County.	Parish.	Area to be revoked. About	Date of Notification of Reserve.
Ms. 85-24,520	Part of 218a.....	Bourke and Clarendon	Kinilibah and Maror...	1,390 acres	26th November, 1878.
„ „	Part of 218a Extn.	Bourke	Kinilibah	689½ acres...	28th June, 1880.
„ „	Part of 665	Bourke	Kinilibah	790 acres ...	29th July, 1874.
„ „	Part of 1,847 ...	Bourke and Clarendon	Kinilibah and Maror...	1,320 acres	8th December, 1879.

The Executive Council advise that the recommendation herein set forth be approved, and the necessary notices issued.—Alex. C. Budge, Clerk of the Council. Min. 85/56—29/12/85. Confirmed, 8/1/86. Approved.—Carrington, 29/12/85.

No. 9.

Gazette Notice.

Revocation of Temporary Reserves.

Department of Lands, Sydney, 23 January, 1886.

It is hereby notified, for general information, that His Excellency the Governor, with the advice of the Executive Council, has been pleased to revoke, under the Crown Lands Act of 1884, the temporary reservation from sale of the portions of land hereinafter described—the revocation to take effect at the expiration of sixty clear days from this date.

GERALD SPRING.

Part of reserve No. 218a extension. County of Bourke, parish of Kinilibah, within the resumed areas of Junee and Marrar Holdings, area 689 acres 2 roods. That part of reserve No. 218a extension, notified 28th June, 1880, for railway purposes, within the boundaries o fmeasured portions No. 111, 112, 113, and 114, parish of Kinilibah, as shown on plan catalogued B 850-1,806 Roll, in the Surveyor-General's Office.

Part of reserve 218a. Counties of Bourke and Clarendon, parishes of Kinilibah and Maror, within the resumed areas of Junee and Marrar Holdings, area about 1,390 acres. That part of reserve No. 218a, notified 26th November, 1878, for railway purposes, withiu measured portions Nos. 102, 103, 105, 106, 107, 108, 109, 110, 111, and 114, parish of Kinilibah, and portion No. 167, parish of Marror, as shown on plan catalogued B 850-1,806 Roll, in the Surveyor-General's Office.

Part of reserve No. 665. County of Bourke, parish of Kinilibah, within the resumed areas of Junee and Marrar Holdings, area about 790 acres. That part of reserve No. 665, notified 29th July, 1874, for water supply, within the boundaries of measured portions Nos. 107, 108, 109, 110, 111, 112, and 114, parish of Kinilibah, as shown on plan catalogued B 850-1,806 Roll, in the Surveyor-General's Office.

Part of reserve No. 1,847. Counties of Bourke and Clarendon, parishes of Kinilibah and Maror, within the resumed areas of Junee and Marrar Holdings, area about 1,320 acres. That part of reserve No. 1,847, notified 8th December, 1879, for ballast for railway purposes, within measured portions Nos. 101, 102, 103, 105, 106, 107, 108, 109, and 110, parish of Kinilibah, and portion No. 167, parish of Marror, as shown on plan catalogued B 850-1,806 Roll, in the Surveyor-General's Office.

No 10.

Memo. from Surveyor-General to Under Secretary for Lands.

A tracing is enclosed showing by red parts of reserves 665, 218a, 218a extension, and 1,847, cancelled 23rd January, 1886.

Counties of Bourke and Clarendon, parishes of Kinilibah and Marror.

For the information of the Crown Lands Agent at Wagga Wagga.

G. LEWIS,

11 February, 1886. (For the Surveyor-General).

Minutes on above.

Dealt with in Reserves Branch. In view of proposed subdivision for village requirements, and pending subdivision, in this locality, it is submitted that the land be resumed without delay.—P. F. Adams, Surveyor-General, 22 March, 1886. Submitted.—C.O., 22/3/86. Approved.—H.C., 22/3/86.

No. 11.

No. 11.

The Under Secretary for Lands to The Crown Lands Agent, Wagga Wagga.

Sir, Department of Lands, Sydney, 13 February, 1886.

I am directed to transmit herewith, for your information, a description with a tracing showing those parts of reserves No. 665, 218, 218a extension, and 1,847, counties of Bourke and Clarendon, which have been revoked by notice in the Government Gazette of the 23rd ultimo, the revocation taking effect at the expiration of sixty clear days from the date thereof.

I have, &c.,
R. H. DE LOW,
(For the Under Secretary).

No. 12.

Messrs. Cape & Kent to The Secretary for Lands.

Sir, Commercial Union Chambers, Pitt and Hunter Streets, Sydney, 20 March, 1886.

Re Marra Reserve, we have the honor to bring under your notice the following case :—

On 26th* January, 1886, the Minister revoked the reserve as shown on the accompanying plan. Our client, the lessee of the run, informs us that the portion of the revoked reserve, and edged blue, contains three quarries, from which the railway line has been supplied with ballast. There is also a line of sleepers laid from one of the quarries to the railway line. This is the only available locality between Junee and Narrandera where ballast can be obtained.

We respectfully submit that by the temporary withdrawal from sale no injury can result.

We understand that the land is open for sale on the 25th instant, and on this account we would ask that immediate attention be given to the matter, and that the land be withdrawn from sale, and the reserve re-gazetted, and the district surveyor instructed to report on the matter. Kindly return the plan.

We have, &c.,
CAPE & KENT.

* Query.—23rd January, 1886. No plan received in Miscellaneous Branch.—A.M.D., 22/3/86.

No. 13.

Executive Council Minute.

Reserve from sale under the 101st section of the Crown Lands Act of 1884.

Department of Lands, Sydney, 23 March, 1886.

It is recommended to His Excellency the Governor and the Executive Council that the portion of Crown Land described in the annexed Schedule be reserved from sale, under the 101st section of the Crown Lands Act of 1884, for the purposes mentioned in connection therewith.

HENRY COPELAND.

SCHEDULE.

Registration Number. Miscellaneous.	Area about.	Reserve No.	County.	Purpose of Reservation.
85-24,520...	2,104 acres	25	Bourke and Clarendon	For village requirements and pending subdivision.

The Executive Council advise that the land herein described be reserved from sale in terms of the said Act.—Alex. C. Budge, Clerk of the Council. Min. 86–16, 23/3/86. Confirmed.—30/3/86. Approved.—Carrington, 23/3/86.

No. 14.

Gazette Notice.

Department of Lands, Sydney, 23 March, 1886.

Reserve from sale for village requirements and pending subdivision.

His Excellency the Governor, with the advice of the Executive Council, directs it to be notified that, in pursuance of the provisions of the 101st section of the Crown Lands Act of 1884, the land specified in the Schedule appended hereto shall be reserved from sale for village requirements and pending subdivision, and is hereby reserved accordingly.

HENRY COPELAND.

No. 25, subdivision of the counties of Bourke and Clarendon, parishes of Kinilibah and Maror, within resumed areas of Junee and Marrar holdings, area about 2,104 acres. The Crown Lands within the following boundaries: Commencing at the north-east corner of portion No. 112, parish of Kinilibah, county of Bourke; bounded thence on the north-west by that portion and the north-west boundary of portion No. 113, bearing south-westerly to the north-west corner of No. 113; thence on part of the west by the west boundary of that portion south to the north-west corner of portion No. 111; bounded thence on the north by a line and the north boundary of portion No. 114, bearing west to the north-west corner of portion No. 114; thence on the west by the west boundary of that portion and a line crossing the railway line from Narrandera to Junee, bearing south to the northern boundary of portion No. 108; thence on the north-east by part of the north-east boundary of that portion and the north-east boundary of portion No. 107, bearing north-westerly to the north-west corner of portion No. 107; thence on the west by the west boundary of that portion and the west boundaries of portions Nos. 106 and 105, bearing south to the south-west corner of No. 105; thence on the south by the south boundary of that land, bearing east to a point north of the north-west corner of portion No. 103; thence again on the west by the west boundaries of that portion and of portion No. 102, bearing south to the south-west corner of No. 102; again on the south by the south boundary of that portion, bearing east to its extremity; thence on the east by a line partly forming the east boundaries of portions Nos. 102, 103, 167 (parish of Maror, county of Clarendon),

No. 109 (parish of Kinilibah, county of Bourke), and No. 110 (same parish), bearing north, crossing the railway line aforesaid, to the south-east boundary of portion No. 111 aforesaid; thence on the south-east by part of the south-east boundary and by the south-east boundary of portion No. 112 aforesaid, bearing north-easterly to the south-east corner of portion No. 112; and thence on the east by the east boundary of that portion, bearing north to the point of commencement, as shown on plan catalogued B. 850-1,806 Roll, Surveyor General's Office.

The above is in lieu of parts of reserve No. 218A and 218A extension, cancelled 23rd January, 1886, and is within the Land Board District of Wagga Wagga.

No. 15.

The Under Secretary for Lands to The Crown Lands Agent, Wagga Wagga.

Sir, Department of Lands, Sydney, 23 March, 1886.

I am directed to invite your attention to a notice, published in this day's Government Gazette, of the reservation from sale of 2,104 acres, in the counties of Bourke and Clarendon, parishes of Kinilibah and Maror, and to impress upon you the necessity of taking every precaution to prevent the land, or any portion of it, being conditionally purchased.

Should an applicant insist on his application being received, you must caution him, in terms of paragraph 39 of the Instructions to Crown Lands Agents.

A tracing showing the reserve will be forwarded with as little delay as possible, and on receipt it must be charted, as directed by paragraph 148 of the Instructions before refered to.

I have, &c.,
R. H. DE LOW,
(For the Under Secretary).

No. 16.

The Under Secretary for Lands to Messrs. Cape & Kent.

Gentlemen, Department of Lands, Sydney, 24 March, 1886.

I am directed to invite your attention to the Government Gazette of the 23rd instant, from which you will perceive that a portion of land, containing 2,104 acres, in the counties of Bourke and Clarendon, parishes of Kinilibah and Maror, has been reserved from sale, under the 101st section of the Crown Lands Act of 1884, for village requirements and pending subdivision, in accordance with your application of the 20th instant.

I have, &c,
R. H. DE LOW,
(For the Under Secretary).

No. 17.

Memorandum from Mr. G. Lewis to The Under Secretary for Lands.

8 April, 1886.

A TRACING is enclosed showing, by green edging, reserve 25, for village requirements and pending subdivision, notified 23rd March, 1886, counties of Bourke and Clarendon, parishes of Kinilibah and Maror, for the information of the Crown Lands Agent at Wagga Wagga.

I have, &c.,
G. LEWIS,
(For the Surveyor-General).

Minutes on above.

After informing Land Agent, it is submitted that papers be returned to Reserve Branch. Mr. G. Lewis, 14/4/86.

Dealt with in Reserve Branch.—J.F., for G. LEWIS, 28/4/86.

Charting Branch.—J.D., *pro* R. H. DE LOW, 30/4/86.

No. 18.

The Under Secretary for Lands to The Crown Lands Agent, Wagga, Wagga.

Sir, Department of Lands, Sydney, 12 April, 1886.

I am directed to transmit herewith, for your information, a description, with tracing, showing certain land in the counties of Bourke and Clarendon, which, by notice in the Government Gazette of the 23rd ultimo, has been reserved from sale, under the 101st section of the Crown Lands Act of 1884, for village requirements and pending subdivision.

I have, &c.,
R. H. DE LOW,
(For the Under Secretary).

Copies of all reports, minutes, and papers having reference to a reserve in the county of Mitchell, parish of Brewarrina, proclaimed a special area on the 2nd of April, 1886.

SCHEDULE.

No. 1.

Mr. George Faithfull to The Secretary for Lands.

Sir, Brewarrina Station, 2 November, 1882.

I have the honor to request that you will grant me permission to ringbark and clear of scrub the southern portion of water reserve No. 354, *i.e.*, south of a line drawn easterly from the south-east corner of portion No. 64, parish of Buckinbong, to the Old Man Creek; and thence bounded by that creek to its junction with portion No. 91, parish of Brewarrina. The above water reserve is situated in the parish of Brewarrina, in the county of Mitchell. Tracing enclosed.

I have, &c.,
GEORGE FAITHFULL,
Agent for W. P. Faithfull.

Mr. Wood, for duplicate tracings.—W.F.P., 13/11/82. Duplicate tracing herewith.—20/11/82. Plan to Lands, and inform that application has been referred to F. R. Condell for report.—W.F.P., 20/11/82.

No. 2.

Mr. George Faithfull to The Secretary for Lands.

Sir, Brewarrina Station, 2 November, 1882.

I have the honor to request that you will grant me permission to ringbark and clear of scrub that portion of water reserve No 353, in the parish of Brewarrina, in the county of Mitchell, situated between a line drawn about south-east from the south-east corner of portion No. 94, in the parish of Brewarrina, and a line drawn south-east from the intersection of the western boundary of water reserve No. 354, with water reserve No. 353.

I enclose a tracing showing the portion of land referred to.

I have, &c.,
GEORGE FAITHFULL,
Agent for W. P. Faithfull.

Forwarded for early report, in accordance with previous instructions. Mr. Forest Ranger Condell.—H.W., B.C., 22/11/82.

No. 3.

No. 3.

The Under Secretary for Mines to The Under Secretary for Lands.

THE accompanying plan, showing land claimed to be held under five years pastoral lease, for which application for permission to ringbark timber has been made, in accordance with the provisions of the Ringbarking on Crown Lands Regulation Act of 1881, is forwarded to the Lands Department, with a request that it may be stated whether--

District, Murrumbidgee; Run, Brewarrina. Area referred to, shown by red edge.

1. Any of the land has been measured.
2. Whether it is held under auction or pre lease.
3. Whether it forms portion of a timber reserve.

HARRIE WOOD,
Under Secretary.

B.C., Department of Mines, 22 November, 1882.

Minutes on above.

No pre or auction lease within the area applied for.—W.H.H., 28/11/82. Charting Branch,—Has the land been measured?—S.F., 29/11/82. The land has not been measured.—M.O.C.B., for Surveyor-General, 9/12/82. Reserve Branch.—There are no timber reserves within the area traced red on the enclosed tracing.—G.L., 12/1/83. The Under Secretary for Mines.—H.C., for the Under Secretary, B.C., Lands, 22/1/83.

No. 4.

The Under Secretary for Mines to Mr. G. Faithfull.

Sir, Forest Branch, Department of Mines, Sydney, 22 November, 1882.

I have the honor to inform you that your application of 2nd instant, for permission to ringbark timber on the Brewarrina Run, Lachlan District, has been referred for the report of Mr. Forest Ranger Condell (Narrandera).

I have, &c.,
HARRIE WOOD,
Under Secretary.

No. 5.

Mr. Forest Ranger Condell to The Under Secretary for Mines.

Report by Mr. Forest Ranger J. G. Condell on application for permission to ringbark timber upon a run.

Applicant, W. P. Faithfull, Brewarrina; Pastoral district, Murrumbidgee.

Sir, Narrandera, 18 December, 1882.

In pursuance of instructions, dated 22nd November, 1882, I have the honor to state that, on the 11th and 12th December, 1882, I personally inspected the timber on the land comprised in the areas referred to in the above-mentioned application, and beg to forward my report and recommendation thereon.

Area applied for, about 960 acres. Kind of trees it is sought to ringbark:—Box, bull-oak, and pine scrub.

The species and local names of all trees growing upon the land desired to be ringbarked, with estimate of the number per acre, and proportionate distribution of each kind, their value with regard to local circumstances, such as demand for fuel, timber or shelter, and the supposed effect of their removal upon climate, &c.

The timber growing on the area it is sought to ringbark consists of pine, box, and bull-oak. The timber is distributed over the whole area, none of the land being free from timber and pine scrub. The numbers of each kind of timber or trees growing on the area per acre are—pine, about eight or nine trees; box, nine or ten trees; and bull-oak, five or six trees. Some of the pine is 15 to 18 inches diameter, and more from 3 inches to 15 inches in diameter. The box timber is scrubby and unsound, and the bull-oak scrubby and of no value.

The ringbarking of the above-mentioned trees on the areas described below, and with the exceptions specified, would not be objectionable in the public interest, and would, I believe, have the effect of improving the growth of the grass, and of the timber not ringbarked, and would prevent the growth of scrub.

The trees recommended to be excepted, their numbers per acre, and proportionate distribution of each kind, with reasons why they should not be ringbarked, are as here noted.

I would recommend that all pine over 2 inches in diameter be exempted from ringbarking, pine being the only valuable timber growing in the area it is sought to ringbark. I estimate the number of pine trees per acre to be about eight or nine trees growing all over the area.

The area described contains about 960 acres heavily timbered, and 960 acres lightly timbered.

The physical character of the land is level. The soil—red gritty loam.

The present quality of grass is indifferent, and it is estimated that 4 acres are required to feed a sheep; and the land is watered by a creek, the supply from which is at present good.

At the time of inspection, I found that part of the land comprised within this area had already been ringbarked; and therefore furnish the following estimate of the kinds, number per acre, area, date when carried out, number of trees now growing, and apparent effect of the operation. Nil.

Upon the annexed plan I have sketched the boundaries of the land desired to be ringbarked, the boundaries of that recommended to be ringbarked, the boundaries of that which should be excepted from ringbarking operations, the boundaries of that upon which ringbarking has already been done, the approximate position of leading ranges, &c., and the distribution of the timber.

With a view to the several matters touched upon being fully understood, and the report rendered as complete as possible, I may state about one-half of the reserve fronting the Murrumbidgee River, and which it is now asked to ringbark, is timbered with valuable red gum timber.

I am of opinion that it would benefit the land very much to kill the useless timber, as well as encourage the growth of grass and of the remaining timber.

The following is a detailed description of the boundaries of the land recommended to be ringbarked.

Area, about 960 acres. The whole of the timber, viz., box, bull-oak, and pine scrub, under 2 inches in diameter, on the area coloured pink, being water reserve No. 353, county of Mitchell, parish of

Brewarrina, situated between a line drawn south-east from the south-east corner of portion No. 94, in the parish of Brewarrina; thence along the north-western boundary of water reserve No. 353, to the south-western corner of water reserve No. 354, about 1½ mile; thence south-east about ¼ mile to the south-eastern boundary; thence north-easterly about 1½ mile; thence north-easterly about ¼ mile, to the point of commencement.

I have, &c.,
J. G. CONDELL,
Forest Ranger.

No. 6.

Mr. Forest Ranger Condell to The Under Secretary for Mines.

Report by Mr. Forest Ranger J. G. Condell on application for permission to ringbark timber upon a run.

Applicant, W. P. Faithfull, Brewarrina; Pastoral district, Murrurundi.

Sir, Narrandera, 19 December, 1882.

In pursuance of instructions, dated 22nd November, 1882, I have the honor to state that on 11th and 12th December, 1882, I personally inspected the timber on the land comprised in the areas referred to in the above-mentioned application, and beg to forward my report and recommendation thereon.

Area applied for, coloured pink, about 1,280 acres. Kind of trees it is sought to ringbark—Box, bull-oak, and pine scrub.

The species and local names of all trees growing upon the land desired to be ringbarked, with estimate of the number per acre, and proportionate distribution of each kind, their value with regard to local circumstances—such as demand for fuel timber or shelter—and the supposed effect of their removal upon climate, &c.

The timber growing on the area it is sought to ringbark consists of pine, box, and bull-oak. The timber is distributed over the whole area, none of the land being free from timber and pine scrub. The numbers of each kind of trees growing on the area per acre are—Pine, about ten or twelve trees; box, nine or ten trees; and bull-oak, five or six trees.

Some of the pine is matured, and more from 5 inches to 12 inches in diameter. The box timber is scrubby and unsound, and the bull-oak scrubby and of no value, the timber being mixed up together and growing thickly.

The ringbarking of the above-mentioned trees on the areas described below, and with the exceptions specified, would not be objectionable in the public interest, and would, I believe, have the effect of encouraging the growth of the grass and of the remaining timber, and would assist in preventing the growth of scrub.

The trees recommended to be excepted, their numbers per acre, and proportionate distribution of each kind, with reasons why they should not be ringbarked, are as here noted.

I would suggest that all pine over 2 inches in diameter be exempted from ringbarking, as pine is the only valuable timber on the area. I estimate the number of pine trees per acre to be about ten or twelve, growing all over the area.

The area described contains about 1,280 acres heavily timbered; 1,280 acres lightly timbered.

The physical character of the land is level. The soil—red gritty loam.

The present quality of the grass is indifferent, and it is estimated that 4 acres are required to feed a sheep; and the land is watered by a creek, the supply from which is at present plentiful.

At the time of inspection I found that part of the land comprised within this area had already been ringbarked, and I therefore furnish the following estimate of the kinds, number per acre, area, date when carried out, number of trees now growing, and apparent effect of the operation. Nil.

Upon the annexed plan I have sketched the boundaries of the land desired to be ringbarked, the boundaries of that recommended to be ringbarked, the boundaries of that which should be excepted from ringbarking operations, the boundaries of that upon which ringbarking has already been done, the approximate position of leading ranges, &c., and the distribution of the timber.

With a view to the several matters touched upon being fully understood, and the report rendered as complete as possible, I may state that about one-half of the reserve fronting on the Murrumbidgee River, "and which it is not sought to ringbark," is timbered with red-gum and box—the former a useful and valuable timber.

I am of opinion that it would benefit the land very much to destroy the useless timber; it would also encourage the growth of grass and of the timber remaining.

The following is a detailed description of the boundaries of the land recommended to be ringbarked:—Area, about 1,280 acres. The whole of the timber, viz., box, bull-oak, and pine scrub, on the area coloured pink, "being portion of water reserve No. 354, county of Mitchell, parish of Brewarrina." Commencing at a line drawn easterly from the south-east corner of portion No. 64, parish of Buckingbong, to the Old Man Creek; and thence bounded by that creek to its junction with portion No. 91, parish of Brewarrina.

I have, &c.,
J. G. CONDELL,
Forest Ranger.

No. 7.

Mr. Forest Ranger Condell to The Under Secretary for Mines.

Sir, Narrandera, 19 December, 1882.

I have the honor to inform you that I was engaged inspecting water reserves Nos. 353 and 354, during the 11th and 12th instant, to report on the applications of Mr. Faithful to ringbark timber on those reserves.

I have, &c.,
J. G. CONDELL,
Forest Ranger.

No. 8.

No. 8.

Mr. G. Faithfull to The Minister for Mines.

Sir, Brewarrina, 27 December, 1882.

With reference to my letters of 20th November last, applying for permission to ringbark portions of water reserves Nos. 353 and 354, in the parish of Brewarrina, county of Mitchell, I have the honor to request that you will inform me if I am at liberty to commence ringbarking, the said country having been inspected by Mr. Forest Ranger Condell.

I have, &c.,
GEO. FAITHFULL,
(*Pro* W. P. Faithfull).

[*Minutes on above.*]

The case is now awaiting certain information asked for from Lands Department. Mr. Faithfull may be advised that he must not commence to ringbark until he receives an authority under the hand of the Secretary for Mines.—A.A.D., 3/1/83.

Yes.—H.W., 4/1/83. Inform. G. Faithfull informed, 8/1/83.

No. 9.

The Under Secretary for Mines to Mr. W. P. Faithfull.

Sir, Department of Mines, Forest Branch, Sydney, 29 December, 1882.

Referring to your application for permission to ringbark timber upon portion of the Brewarrina Run, I have the honor to inform you that the fee towards defraying the cost of inspection has not yet been received.

I have, &c.,
HARRIE WOOD,
Under Secretary.

No. 10.

Mr. G. Faithfull to The Under Secretary for Mines.

Sir, Brewarrina, 4 January, 1883.

In answer to your letter of date 29th December, 1882, informing me that the fee towards defraying the cost of inspection of land applied for to ringbark not having been received, I enclose a cheque for £6 herewith.

I have, &c.,
GEO. FAITHFULL.

[*Minutes on above.*]

£6 cheque.—T.C.B., 6/1/83. Receipt sent, 6/1/83. The Registrar to note.—A.A.D., 6/1/83. Noted and returned.—T.C.B., 6/1/83.

Mr. Forest Ranger Condell recommends that pine over 2 inches in diameter should be excepted from ringbarking operations. Ask him whether pine below that diameter, or even up to 3 or 4 inches, is "ringbarked" or cut down; also whether the estimated number of pine trees per acre, ten to twelve, includes the saplings above 2 inches.—W.F.P., 20/1/83.

No. 11.

Mr. G. Faithfull to The Under Secretary for Lands.

Sir, Brewarrina Station, Wagga Wagga, 6 January, 1883.

I have the honor to suggest that the Forest Ranger for the district be instructed to inspect the portion of land situated partly in the parish of Brewarrina, and partly in Buckinbong, in the county of Mitchell, a tracing of which is enclosed, with the view of proclaiming that part coloured green as a timber reserve, there being much valuable timber thereon.

I have, &c.,
GEORGE FAITHFULL,
(*Per* W. P. Faithfull).

Minutes on above.

The Under Secretary for Mines.—F.H.W. (for the Under Secretary), B.C., 10 January, 1883.

For early report of Mr. Forest Ranger Condell, whose attention is directed to his reports upon applications to ringbark portion of this area.—H.W., B.C., 23 January, 1883.

No. 12.

The Under Secretary for Mines to Mr. G. Faithfull.

Sir, Department of Mines, Forest Branch, Sydney, 8 January, 1883.

Referring to your letter of the 27th ultimo, respecting your application for permission to ringbark timber on the Brewarrina Run, I have the honor to inform you that you must not commence ringbarking until you receive an authority under the hand of the Secretary for Mines.

I have, &c.,
HARRIE WOOD,
Under Secretary.

No. 13.

The Under Secretary for Mines to Mr. Forest Ranger Condell.

Sir, Department of Mines, Forest Branch, Sydney, 25 January, 1883.

With reference to your report on the application for permission to ringbark upon the Brewarrina Run, in which you recommend that pine over 2 inches diameter should be excepted from ringbarking operations, I have the honor to request that you will be good enough to state whether pine below that diameter, over or even up to 3 or 4 inches, is ringbarked or cut down, and, further, whether the estimated number of pine trees per acre, ten to twelve, includes the saplings above 2 inches.

I have, &c.,
HARRIE WOOD,
Under Secretary.

No. 14.

Mr. Forest Ranger Condell to The Under Secretary for Mines.

Sir, Narrandera, 27 January, 1883.

Referring to your letter of the 25th instant, requesting to be informed whether pine below 2 inches in diameter, or even up to 3 or 4 inches, is ringbarked or cut down, and, further, whether the estimated number of trees, pine, per acre, ten to twelve, includes the saplings above 2 inches, on Brewarrina Run,—

1st. I have the honor to inform you that no timber is ringbarked on the land that I have reported on.

2nd. The number of pine trees, ten to twelve, does not include the saplings above 2 inches. There is, perhaps, about a like number of young pines from 2 to 8 inches in diameter, viz., ten to twelve per acre

I have, &c.,
J. G. CONDELL,
Forest Ranger.

No. 15.

Mr. Forest Ranger Condell to The Under Secretary for Mines.

Sir, Narrandera, 27 January, 1883.

I have the honor to inform you that in forwarding Mr. G. Faithfull's application to cause certain lands in the Brewarrina Run to be reported on with the view of proclaiming it a forest reserve, the tracing of the land has not been forwarded with the application. I therefore respectfully request that the tracing may be forwarded to me, as a guide to the land it is desired to reserve.

I have, &c.,
J. G. CONDELL,
Forest Ranger.

Minutes on above.

Tracing appears to have become detached—has it been sent?—W.F.P.

Mr. Bennett, Mr. Bell,—The tracing was not detached by me, and its omission would, I think, have been noticed when dispatching, if detached.—C.A.B.

To the best of my belief the tracing was forwarded.—J.R.B.

Inform that the tracing appears to have been attached to the application when it left this office. The area referred to lies east of portions 21, 51, 52, and 53, and includes the greater part of the area tinted on enclosed tracing, but of course the boundaries of any area that may be recommended for reservation should depend upon the character of the timber.—W.F.P., 1/2/83.

No. 16.

The Under Secretary for Mines to Mr. Forest Ranger Condell.

Sir, Department of Mines, Forest Branch, Sydney, 5 February, 1883.

In reply to your letter of 27th ultimo, I have the honor to inform you that the tracing, in illustration of Mr. Faithfull's application for a timber reserve on Brewarrina Run, appears to have been attached to the papers when they left this office.

The area referred to lies east of portions 21, 51, 52, and 53, and includes the greater part of the area tinted on enclosed tracing; but of course the boundaries of any area that may be recommended for reservation should depend upon the character of the timber.

I have, &c.,
HARRIE WOOD,
Under Secretary.

No. 17.

Mr. Forest Ranger Condell to The Under Secretary for Mines.

Sir, Narrandera, 2 March, 1883.

I have the honor to inform you that I have inspected the timber Mr. Faithfull applies to have reserved, and I find the land, viz., that part tinted green, contains a large quantity of valuable pine timber, I consider about ten to twelve matured trees to the acre, and twelve to fifteen young trees. Pine is the only timber on the land of any value.

I would respectfully suggest that the area hereunder described be proclaimed a forest reserve, viz., the portion of land situated partly in the parish of Brewarrina and partly in the parish of Buckingbong, in the county of Mitchell, as coloured green on annexed tracing.

I may add that on Mr. Faithfull's applying to ringbark the timber on this area I recommended that box, bull-oak, and pine scrub, under 3 inches in diameter, be ringbarked, as this timber is quite useless, and would improve it as a forest reserve, giving the useful timber room to grow.

I have, &c.,
J. G. CONDELL,
Forest Ranger.

Minutes

Minutes on No. 17.

In accordance with minute, and under ranger's report, the Lands Department may be asked to proclaim the reserve for preservation of timber, as shown by green lines on tracing, if unobjectionable.—A.A.D. (for the Chief Clerk), Forest Branch, 19/3/83. Submitted—H.W., 20/3/83.

Approved—J. P. ABBOTT, 22/3/83. The Under Secretary for Lands.—H.W., B.C., 29 March, 1883.

No. 18.
Memorandum.

Ringbarking, Brewarrina Run, district of Murrumbidgee; area, 35 square miles; rent, £63.

MR. W. P. Faithfull applied for permission to ringbark timber upon about 2,200 acres of the run. He subsequently applied to have a timber reserve proclaimed, including part of this area.

The ranger recommends that permission should be given to ringbark pine scrub under 2 inches diameter, box, and bull-oak, excepting the largest pine, estimated at ten to twelve trees per acre, and saplings 2 to 8 inches diameter, about the same number. He now recommends that the greater part of the area should be included in a timber reserve.

It was decided not to grant permission to ringbark timber on a forest reserve.

It is asked whether, under the circumstances, the permission should be given in this case.

W.F.P., Forest Branch, 9 March, 1883.

Minutes on No. 18.

Submitted.—H.W., 10/3/83.

I can see no reason for allowing the timber upon a forest reserve to be ringbarked, and as the ranger thinks this area, or the greater part of it should be made a timber reserve, I think the application may be refused, with the view to the making of the area a forest reserve.—J. P. ABBOTT, 10/3/83.

For necessary action in Survey Office.—J.D.D., *pro* F. H. WILSON, 4/4/83. Mr. G. Lewis.

Mr. District Surveyor Bolton, for consideration and report as to the advisableness of reserving land shown by green lines on accompanying tracing for the preservation of timber.—G. LEWIS (for the Surveyor-General), 17 April, 1883. District Surveyor Bolton.

Transferred to Mr. Surveyor A. H. Bray, 11 August, 1883.—C. F. BOLTON, District Surveyor.

Replied to by my letter of 19th August.—ARTHUR H. BRAY, Surveyor.

No. 19.
The Under Secretary for Mines to Mr. G. Faithfull.

Sir, Department of Mines, Forest Branch, Sydney, 16 March, 1883.

With reference to your application for permission to ringbark upon the Brewarrina Run, I have now the honor, by direction of the Secretary for Mines, to inform you that the permission sought will not be granted, the making of the area a forest reserve being about to be recommended.

I have, &c.,

HARRIE WOOD.

No. 20.
The Under Secretary for Lands to The Under Secretary for Mines.

Sir, Department of Lands, Sydney, 19 April, 1883.

I have the honor to inform you that the papers in connection with the subject mentioned hereunder have been referred to Mr. District Surveyor Bolton for consideration and report on proposed reserve.

I have, &c.,

J. G. BLAXLAND,

(For the Under-Secretary).

Proposed Forest Reserve, parish of Brewarrina, county of Mitchell.

No. 21.
Mr. Surveyor Bray to The Surveyor-General.

Proposed Forest Reserve, parish of Brewarrina, county of Mitchell.

Sir, Sunny Camp, near Wagga Wagga, 19 August, 1885.

I have the honor to transmit herewith sketch showing proposed forest reserve, in the parish of Brewarrina, county of Mitchell, inspected by me on the 18th August, 1885, in accordance with instructions dated 17th April, 1883, to Mr. District Surveyor Bolton, and transferred to me, 11th August, 1885.

I would recommend that the whole of the land shown within green edging on sketch herewith be proclaimed a forest reserve.

The part south of the Old Man Creek, including measured portions Nos. 95 and 96, is thickly timbered with pine, a good proportion of which is sound mature timber.

The land south of the Old Man Creek contains a quantity of good gum timber, and, as I understand, an application has been made to have it proclaimed a forest reserve, I would suggest that it be included in this reserve, as shown on sketch.

I have, &c.,

ARTHUR H. BBAY,

Surveyor.

Minutes on No. 21.

Forwarded to the Surveyor-General, 19th August, 1885, with a recommendation that Mr. Bray's suggestion be acted upon, and that the reserve for the preservation of timber be duly notified.—L. F. BOLTON, District Surveyor.

Mr. Gerard,—Is the land shown within green edge on lithograph within a leasehold or a resumed area?—J.F., for G.L., 26/10/85.

The land shown by green edging on attached lithograph is situated within the leasehold and resumed areas of Brewarrina holding.—F.G, 27/10/85.

No. 22.

Memorandum by Surveyor-General.

THE surveyor reports that the area shown within green edge on lithograph, parish of Brewarrina, county of Mitchell, south of the Old Man Creek, is thickly timbered with pine of good proportion, and that the part north of that creek contains good gum, at the same time recommending its reservation as a forest reserve.

In view of the report and of the recommendation of District Surveyor Bolton, it is submitted for the consideration of the Secretary for Lands that the area within green edge on lithograph, containing 6,258 acres, be notified as a forest reserve, as requested by the Mining Department, and that the parts of water reserves Nos. 353 and 354 affected be cancelled.

The proposed reservation is situated partly within the leasehold and partly within the resumed area of the Brewarrina holding, Land Board and Land District of Wagga Wagga.

G. LEWIS,
(For the Surveyor-General).

3 November, 1885.

Minutes on No. 22.

Submitted.—R.H.D., 14/11/85. C.O., 16/11/85.

In my opinion this is a case in which it would be a public wrong to proclaim this area as a forest reserve. The whole of the land contained in this reserve is within what is now the resumed area To make a forest reserve of it would be practically to secure by a lease one-half of the Brewarrina Run to the lessee, and the other half to him by a forest reserve. This I shall not do. I notice by the papers that the lessee of the run has moved for this reserve to be proclaimed a forest reserve. This may have been upon public grounds; but I think, if so, the lessee is mistaken in his view of the question. The whole of this reserve No. 354 is at once to be cancelled and thrown open for setttement.—J. P. ABBOTT, 20/11/85.

No. 23.

Mr. Geo. H. Stevens to The Secretary for Lands.

Sir,

Narrandera, 25 November, 1885.

The enclosed is all the information I can obtain from the District Surveyor, Mr. C. F. Bolton, Wagga Wagga. I and several others have been waiting a long time for the chance of getting a home upon one of the many reserves about here, and, judging by Mr. Bolton's memo., are likely to have to wait much longer.

Can you supply more definite information?

My excuse for troubling you is that the Hon. G. R. Dibbs, in his address here to the electors, advised us thus:—"If you want speedy and correct information, address your inquiry to the fountain-head."

I have done so, and await the result.

I have, &c.,
GEO. H. STEVENS.

Minutes on No. 23.

Submitted that the applicant be requested to specify the particular reserves which he desires to have revoked.—R.H.D., 2/12/85. Ask.—F.H.W., for U.S., 3/12/85.

[*Enclosure to No.* 23.]

Memorandum from District Surveyor, Wagga Wagga, to Mr. G. H. Stevens.

YOUR note of 19th instant has been duly received. A general report will be made on all reserves within the resumed areas with a view to the cancellation of those which may be considered no longer required. I am not now in a position to say what reserves will be recommended for cancellation, or when they will be cancelled.

C. F. BOLTON,
District Surveyor.

20 November, 1885.

No. 24.

The Under Secretary for Lands to Mr. G. H. Stevens.

Sir,

Department of Lands, Sydney, 14 December, 1885.

In reply to your letter of the 25th ultimo, I have the honor to request that you will be good enough to specify the particular reserves you desire to have revoked.

I have, &c.,
F. H. WILSON,
(For the Under Secretary).

No. 25.

Mr. G. H. Stevens to The Secretary for Lands.

Sir,

Narrandera, 18 December, 1885.

In reply to your memo., I beg to state that the reserve upon which I should like to select is No. 354, on the boundary of Buckingbong and Brewarrina (Mr. Faithfull's run); but, as I do not wish to leave the neighbourhood, any other reserve that may be thrown open will be occupied, as there are many awaiting the opportunity.

I may remark that, upon inspecting the map of the resumed area upon Mr. Faithfull's run, there are not a hundred acres in one block open for selection, the principal part being taken up by Mr. Faithfull and his friends.

I have, &c.,
G. H. STEVENS.

Minutes

Minutes on No. 25.

Will Mr. G. Lewis please give a reference to the papers relating to the reserve referred to and any available information regarding it?—J.O.D. (*pro* R. H. De Low), 21/12/85.

Reserve No. 354 was reported on by surveyor, and a submission made to the Secretary for Lands that the southern part be notified as a timber reserve, 30th September, 1885, on papers Ms. 85-16,159. —G. LEWIS (for Surveyor-General), 24/12/85. The Under Secretary for Lands. Correspondence Branch to inform applicant of cancellation of reserve No. 354, section 85-21,788.—I.O.D. (*pro* R. H. De Low, 16/3/86.

No. 26.

Executive Council Minute.

Department of Lands, Sydney, 18 January, 1886.

IT is recommended to His Excellency the Governor and the Executive Council that the temporary reservation of the portions of land within described and particularized in the annexed Schedule be now revoked, under the provisions of the Crown Lands Act of 1884, the revocation to take effect at the expiration of sixty clear days from the date of notification thereof in the Government Gazette.

GERALD SPRING.

SCHEDULE.

Registration Number.	No. of Reserve.	County.	Parish.	Area to be revoked. Acres, about.	Date of Notification of Reserve.
85-21,788	354	Mitchell	Brewarrina	3,632	29th December, 1865.

THE Executive Council advise that the temporary reservation of the land referred to be revoked, in terms of the Crown Lands Act of 1884, to take effect from the dates specified.—ALEX. C. BUDGE, Clerk of the Council.

Approved.—CARRINGTON, 19/1/86.

No. 27.

Gazette Notice.

Department of Lands, Sydney, 6 February, 1886.

Revocation of Temporary Reserves.

IT is hereby notified for general information that His Excellency the Governor, with the advice of the Executive Council, has been pleased to revoke, under the Crown Lands Act of 1884, the temporary reservation from sale of the portions of land hereinafter described, the revocation to take effect at the expiration of sixty clear days from this date.

GERALD SPRING.

* * * * *

No. 354, Murrumbidgee River, notified 29th December, 1865, area 3,632 acres, county of Mitchell, parish of Brewarrina, within the leasehold and resumed areas of Brewarrina holding. The Crown lands within the following boundaries: Commencing on the left bank of the Murrumbidgee River, at the north-eastern corner of W. P. Faithfull's portion No. 4 of 604 acres; and bounded thence on the west by the eastern boundary of that land and its continuation bearing south to the north-western boundary of reserve No. 353; on the east by a line forming partly the western boundary of W. P. Faithfull's 640 acres, portion No. 3, distant 80 chains from the western boundary, bearing north to the Murrumbidgee River.

* * * * *

No. 28.

The Under Secretary for Lands to The Crown Lands Agent, Wagga Wagga.

Sir, Department of Lands, Sydney, 6 February, 1886.

I am directed to invite your attention to a notice, published in this day's Government Gazette, of the revocation of reserve No. 354, in the county of Mitchell, parish of Brewarrina, the revocation taking effect on the 8th day of April next.

A tracing showing the reserve will be forwarded with as little delay as possible.

I have, &c.,
R. H. DE LOW,
(For the Under Secretary).

No. 29.

The Surveyor-General to The Under Secretary for Lands.

A TRACING is enclosed showing, by red edging, revocation of reserve No. 354, notified 29th December, 1865, county of Mitchell, parish of Brewarrina, for the information of the Crown Lands Agent at Wagga Wagga.

G. LEWIS,
(For the Surveyor-General),
24 February, 1886.

Minutes on above.

After informing Land Agent, it is submitted that papers be returned to Reserves Branch, to chart parish map.—W. G. LEWIS, 2/3/86.

Map noted. Dealt with in Reserve Branch. Attention is drawn to letter Ms. 85/24,842, enclosed.—G. LEWIS, 12 March, 1886.

No. 30.

No. 30.

The Under Secretary for Lands to The Crown Lands Agent, Wagga Wagga.

Sir, Department of Lands, Sydney, 1 March, 1886.

I am directed to transmit herewith, for your information, a description with a tracing showing reserve No. 354, in the county of Mitchell, parish of Brewarrina, which has been revoked by notice in the Government Gazette of the 6th ultimo, the revocation taking effect at the expiration of sixty clear days from the date thereof.

I have, &c.,
R. H. DE LOW,
(For the Under Secretary).

No. 31.

Mr. District Surveyor Bolton to The Surveyor-General.

Sir, District Surveyor's Office, Wagga Wagga, 4 March, 1886.

With reference to the revocation of reserve No. 354, parish Brewarrina, county Mitchell, notified on 6th February, 1886, I do myself the honor to inform you that portion of the land embraced in such reserve was reported on by Mr. Surveyor Bray's letter of 19th August, 1885, sent to Head Office on 19th August, 1885, in connection with your instructions of 17th April, 1883, to report on an application by Mr. Faithfull for a timber reserve in the parishes of Buckingbong and Brewarrina, county Mitchell.

Herewith I forward a letter from Mr. Faithfull relative thereto.

I have, &c.,
C. F. BOLTON,
District Surveyor.

[*Enclosure to No.* 31.]

Mr. G. Faithfull to Mr. District Surveyor Bolton.

Dear Sir, Brewarrina, 3 March, 1885.

I observe that water reserve No. 354, in the parish of Brewarrina, is to be thrown open to sale. Part of this reserve has been applied for as a timber reserve, and should, I think, be reserved for that purpose, viz., that portion south of a line east from the south-east corner of portion No. 64, parish of Buckingbong, to the Old Man Creek; bounded from thence on the north by the Old Man Creek.

I draw your attention to this, as you may have overlooked the matter.

I have, &c.,
GEORGE FAITHFULL.

P.S.—There is not a timber reserve on this run.

No. 32.

Messrs. Blomfield & Dickson to The Minister for Lands.

Sir, 10 March, 1886.

We would draw your attention to the papers noted in the margin (85-16,159 Ms.—G. Faithfull), and request that the reserve for the preservation of timber may be re-gazetted, as advised by the District Surveyor and another surveyor.

We would point out, the surveyor, after a careful investigation, reported on the necessity of this being made a timber reserve, and yet, when the lessee applied to ringbark the reserve, the Minister for Mines refused, on the ground that the timber was required in the public interest; and yet, when reported on by two surveyors that the reserve should be made for the preservation of timber, Mr. Abbott said it was not required, and ought to be cancelled in the public interest, and thrown open at once for selection, and this without ever having been near the land.

Had Mr. Abbott visited the land we could have understood him differing in opinion; but to take the whole responsibility on himself, in the face of the reports, simply because it would appear that the lessee asked for it to be made a reserve.

We would ask your careful consideration of the facts of the case, and request, if any action is taken, it may be done within sixty days from 6th February, otherwise the opportunity will be lost.

We have, &c.,
BLOMFIELD & DICKSON.

Minutes on above.

Reserve No. 354 was cancelled 6th February, 1886, on papers 85-21,788.—G. Lewis (for the Surveyor-General) 17th March, 1886.

Submitted as to whether sufficient reasons have been given for disturbing the decision on 85-21,788. Specially submitted.—R.H.D., 23/3/86.

No. 33.

The Under Secretary for Lands to Mr. G. H. Stevens.

Sir, Department of Lands, Sydney, 17 March, 1886.

I have the honor, in reply to your letter of the 18th December last, to inform you that the cancellation of the reserve referred to therein, No. 354, in the parish of Brewarrina, county of Mitchell, was notified in Government Gazette of the 29th December, 1865.

I have, &c.,
F. H. WILSON,
(For the Under Secretary).

No. 34.

Mr. G. Faithfull to The Colonial Secretary.

Sir, Brewarrina, *viâ* Wagga Wagga, 20 March, 1886.

As one of your constituents, I write to inform you of a matter which should be brought to your notice, viz., that water reserve No. 354, situated on this run, is to be revoked on April 8 next. In the

the first place, I think it is rather hard lines that so large a reserve on such a small run as this should be thrown open in such a bad season as this, especially as so many large runs have a number of reserves. But the chief thing is, it appears to me, that, at a time like this, the Government should endeavour to obtain as much for the land as possible. Now, if this reserve were subdivided and submitted to auction, I would myself bid £2 per acre for it, and I think the upset price should not be less; a great number of people hold the same idea. It must be noted that said reserve has 1 mile frontage to the Murrumbidgee and 3 miles to the Old Man Creek, and is about 13 miles from Narrandera, so that it is really a valuable piece of land.

As it now stands, it is simply making a present of £2,560 to the man (who shall draw the prize) at the end of five years, without any benefit to the country.

If submittted to auction, there will doubtless be many buyers, and the country will have the benefit of it. If you will draw the attention of your colleagues to the above matter, I feel sure they will have the matter carefully considered, and have the land appraised by a competent person.

I have, &c.,
GEO. FAITHFULL.

Minutes on above.

Can this be stopped?—G.R.D., 23/3/86. Papers at once, please.—C.O., 24/3/86. Papers herewith.—T.N., 27/3/86. Submitted in reference to the decision of Mr. Secretary Abbot.—C.O., 27/3/86. This land to be proclaimed a special area, at £2 per acre, to be open to selection in portions not exceeding 160 acres each.—H.C., 27/3/86.

No. 35.

Mr. G. Faithful to The Minister for Lands.

Sir, Brewarrina, *vid* Wagga Wagga, 20 March, 1886.

Having observed in the Gazette that water reserve No. 354, in the parish of Brewarrina, in the county of Mitchell, is to be revoked on 8th April next, I have the honor to inform you that, being valuable land, situated about 13 miles from Narrandera, and having 1 mile frontage to Murrumbidgee River, also a creek running over 3 miles through the reserve, if this reserve was subdivided, as you might think fit, and submitted to auction, it would realize considerably more to the Treasury than by throwing it open to selection. I am myself prepared to bid for the same if the upset price is fixed at £2 per acre. That portion of the reserve south of the Old Man Creek has been applied for, and should, I think, be gazetted a forest reserve, there being no timber reserve on Brewarrina Run.

I have, &c.,
GEO. FAITHFULL.

No. 36.

Mr. Geo. H. Stevens to The Minister for Lands.

Sir, Narrandera, 24 March, 1886.

I have the honor to inform you I received a memo. from the Lands Office dated 17th instant, being a reply to a letter from me dated 18th December, 1885, and I am under the impression that the memo. is a mistake, and should be obliged for a more speedy reply, if possible, as I and my family have been waiting months for the opportunity to make a home.

The extract referred to is as follows:—"That the cancellation of the reserve referred to therein, No. 354, in the parish of Brewarrina, county of Mitchell, was notified in the Government Gazette of the 29th December, 1865." If this is correct, am I right in presuming that a portion of the said reserve is and has been for twenty years open for selection?

I have, &c.,
GEO. H. STEVENS.

Minutes on No. 36.

Will Mr. G. Lewis please state what action has been taken in this case.—J.O.D., *pro* R. H. De Low, 26/3/86. Reserve No. 354, notified 29th December, 1865, parish of Brewarrina, county of Mitchell, was cancelled 6th February, 1886, on papers Misc. 85-21,788.—G. Lewis (for the Surveyor-General), 31 March, 1886.

No. 37.

Minute-paper for the Executive Council.

Subject.—Recommending proclamation of special area.

Department of Lands, Sydney, 27 March, 1886.

It is recommended to His Excellency the Governor and the Executive Council that the within described area of 3,632 acres, in the county of Mitchell, parish of Brewarrina, being reserve No. 354, which was revoked by notice in the Government Gazette of the 6th February last, be proclaimed a special area, under the 24th section of the Crown Lands Act of 1884, and that the price of the same, by conditional purchase, under sections 22 and 42, be forty shillings per acre, the deposit money be four shillings per acre, and the instalment of balance be two shillings per acre; and for non-residence selections, under section 47, the area of which shall not exceed 160 acres, the deposit money be eight shillings per acre, and the instalment of balance be four shillings per acre.

HENRY COPELAND.

The Executive Council advise that the land referred to be proclaimed a Special Area upon the terms herein set forth.

ALEX. C. BUDGE,
Clerk of the Council.

Minute, 86-17.—30/3/86. Approved.—Carrington, 30/3/86. Confirmed, 6/4/86.

No. 38.

Proclamation.

New South Wales, to wit.
L.S.
CARRINGTON, Governor.

PROCLAMATION by His Excellency The Right Honorable CHARLES ROBERT, BARON CARRINGTON, a Member of Her Majesty's Most Honorable Privy Council, Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

IN pursuance of the provisions of the 24th section of the Crown Lands Act of 1884, I, Charles Robert, Baron Carrington, the Governor of the Colony of New South Wales aforesaid, with the advice of the Executive Council, do hereby proclaim that the following portion of Crown Lands is declared to be set apart as a "Special Area," within which it shall not be lawful to conditionally purchase more than 160 acres or less than 40 acres, and the price shall be £2 per acre for residence conditional purchases, under sections 22 and 42 of that Act, the deposit money four shillings per acre, and the instalments of balance of purchase money two shillings per acre; and on conditional purchases without residence the price per acre, deposit, and all subsequent instalments shall be double those stated above.

No 1 of the county of Mitchell, parish of Brewarrina, within the leasehold and resumed areas of Brewarrina holding, area about 3,632 acres. The Crown Lands within the following boundaries: Commencing on the southern bank of the Murrumbidgee River, at the north-eastern corner of portion No. 4, parish of Buckinbong; bounded thence on the west by a line partly forming the east boundaries of that portion and Nos. 62, 63, and 64, south to the north-western boundary of water reserve No. 353, notified 30th December, 1865; thence on the south-east by part of that north-western boundary north-easterly to the south corner of portion No. 96, parish of Brewarrina; thence on the east by a line partly forming the western boundaries of that portion and Nos. 95, 91, 97, 58, 57, and 3, north to the Murrumbidgee River; and thence by that river downwards, to the point of commencement.

The above-described land was reserved from sale as No. 354 for water supply, 30th December, 1865, and cancelled 6th February, 1886.

Within the Land Board District of Wagga Wagga.

Given under my hand and seal, at Government House, Sydney, this second day of April, in the year of our Lord one thousand eight hundred and eighty-six, and in the forty-ninth year of Her Majesty's reign.

By His Excellency's Command,
HENRY COPELAND.

God Save the Queen!

No. 39.

The Under Secretary for Lands to The Crown Lands Agent, Wagga Wagga.

Sir,

Department of Lands, Sydney, 6 April, 1886.

I have to invite your attention to this day's Government Gazette, containing proclamation of 3,632 acres, in the parish of Brewarrina, county of Mitchell, as a special area, under the 24th section of the Crown Lands Act of 1884, at £2 per acre.

I am to explain that a tracing showing the land referred to will be forwarded as soon as practicable.

I have, &c.,
R. H. DE LOW,
(For the Under Secretary).

No. 40.

The Surveyor-General to The Under Secretary for Lands.

A LITHOGRAPH is enclosed showing "special area" No. 1, proclaimed 6th April, 1886, county of Mitchell, parish of Brewarrina, for the information of the Crown Lands Agent at Wagga Wagga.

G. LEWIS,
(For the Surveyor-General).

13th April, 1886.

Minutes on above.

Dealt with in the Reserves Branch. Correspondence Branch to inform applicant.—J.O.D. (*pro* R. H. De Low), 28/4/86.

No. 41.

The Under Secretary for Lands to The Crown Lands Agent, Wagga Wagga.

Sir,

Department of Lands, Sydney, 21 April, 1886.

I am directed to transmit herewith, for your information, a description, with lithograph, showing certain land in the county of Mitchell, which, by proclamation in the Government Gazette of the 6th instant, has been set apart, under the 24th section of the Crown Lands Act of 1884, as a special area

I have, &c.,
R. H. DE LOW,
(For the Under Secretary).

No. 42.

The Under Secretary for Lands to Mr. G. H. Stevens.

Sir,

Department of Lands, Sydney, 30 April, 1886.

Referring to your letter of the 24th ultimo, I have the honor to inform you that the area within reserve No. 354, in the parish of Brewarrina, county of Mitchell, Land Board District of Wagga Wagga, was proclaimed a special area (*vide* Government Gazette of the 6th instant), under the 24th section of the Crown Lands Act of 1884.

I have, &c.,
F. H. WILSON,
(For the Under Secretary).

No. 43.

No. 43.

The Under Secretary for Lands to Messrs. Blomfield & Dickson.

Gentlemen, Department of Lands, Sydney, 30 April, 1886.

Referring to your letter of the 10th ultimo, I have the honor to inform you that the area within reserve No. 354, in the parish of Brewarrina, county of Mitchell, Land Board District of Wagga Wagga, has been proclaimed a special area, under the 24th section of the Crown Lands Act of 1884. (*Vide* Government Gazette of 6th April, 1886.)

I have, &c.,
F. H. WILSON,
(For the Under Secretary).

No. 44.

The Under Secretary for Lands to Mr. G. Faithfull.

Sir, Department of Lands, Sydney, 30 April, 1886.

Referring to your letter of the 20th ultimo, I have the honor to inform you that the area within reserve No. 354, in the parish of Brewarrina, county of Mitchell, Land Board District of Wagga Wagga, has been proclaimed a special area, under the 24th section of the Crown Lands Act of 1884. (*Vide* Government Gazette, 6th April, 1886.)

I have, &c.,
F. H. WILSON,
(For the Under Secretary).

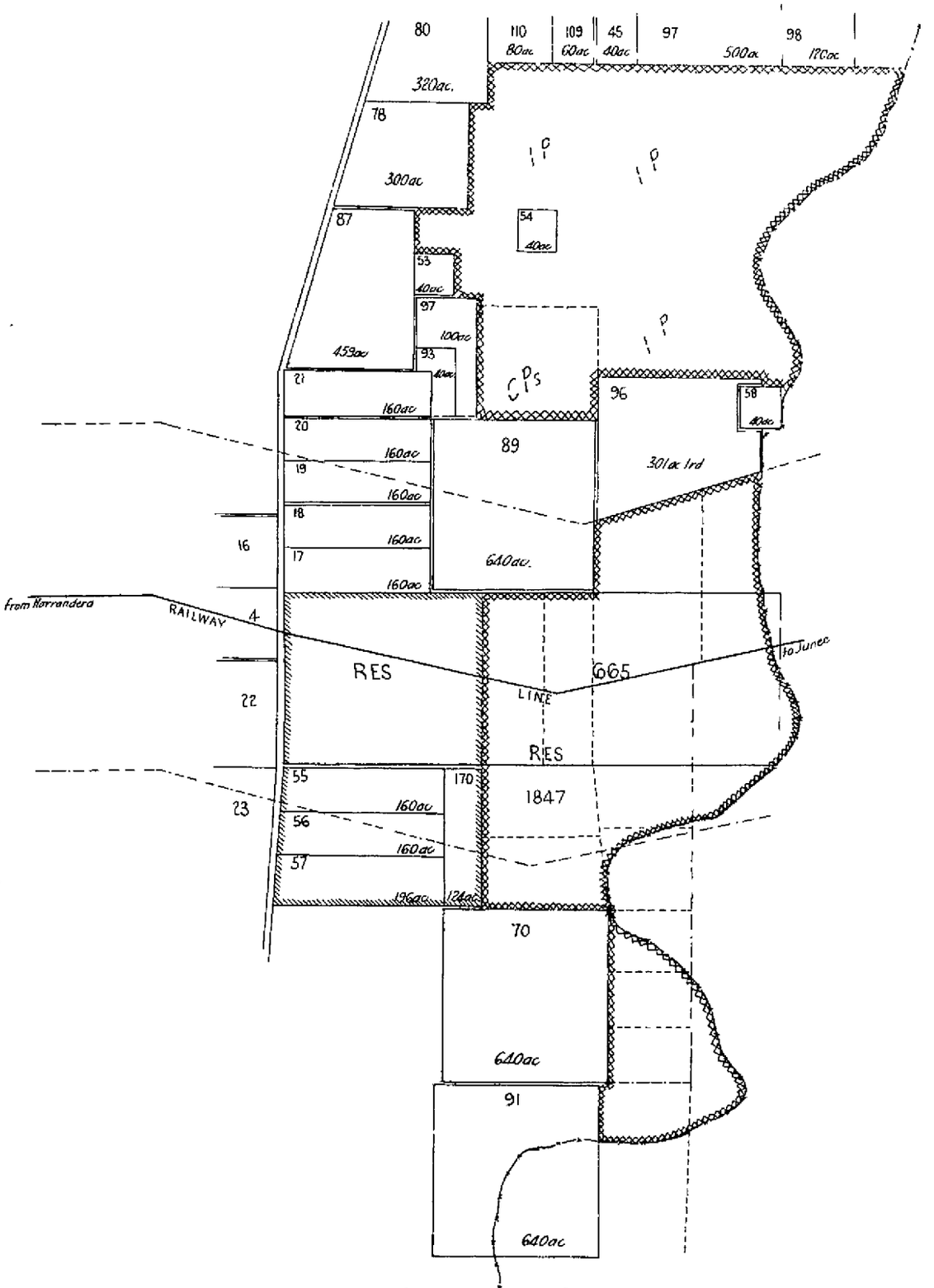
[Ten sketches.]

[3s. 9d.]

Sydney: Thomas Richards, Government Printer.—1886.

(1)

Enclosure B to No 1.



Forwarded to the Surveyor General
with my letter of 29th March 1881
No 81-43
C F Bolton Dpt

Note. That part on original edged Green is on this Copy edged thus wwwwwwww
ditto ditto ditto ditto Red ditto ditto ditto thus xxxxxxxxx
Lines shown on original in pencil are on this Copy shown thus ---- - -
Letters ditto ditto ditto ditto ditto thus CP IP

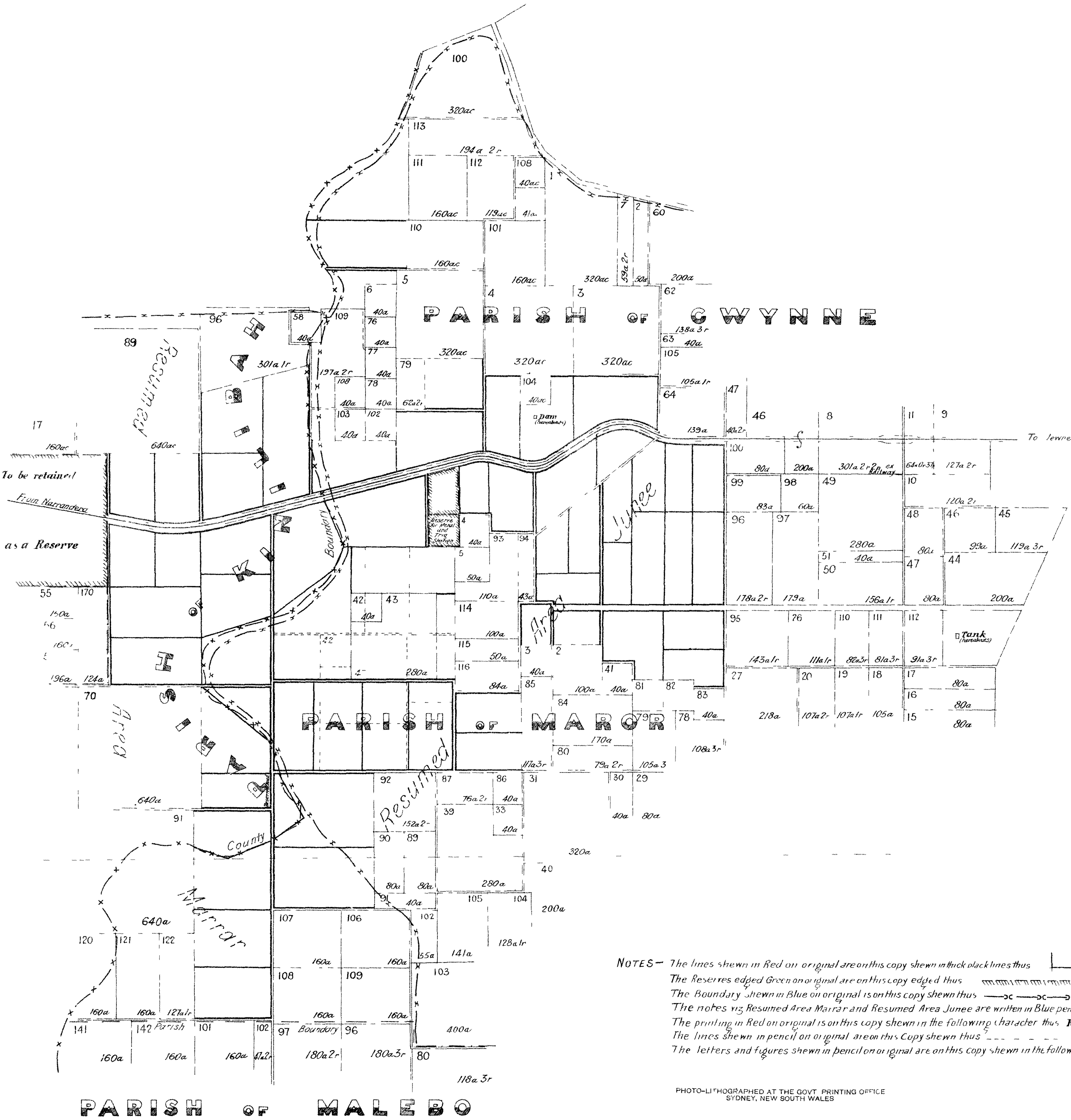
(Sig 578)

PHOTO-LITHOGRAPHED AT THE GOVT PRINTING OFFICE
SYDNEY NEW SOUTH WALES

(2)

Enclosure A to No. 1.

Copy from tracing



NOTES— The lines shewn in Red on original are on this copy shewn in thick black lines thus
The Reserves edged Green on original are on this copy edged thus
The Boundary shewn in Blue on original is on this copy shewn thus
The notes viz Resumed Area Marrar and Resumed Area Junee are written in Blue pencil on original
The printing in Red on original is on this copy shewn in the following character thus **Reserve**
The lines shewn in pencil on original are on this Copy shewn thus
The letters and figures shewn in pencil on original are on this copy shewn in the following character

PHOTO-LITHOGRAPHED AT THE GOVT PRINTING OFFICE
SYDNEY, NEW SOUTH WALES

Forwarded to Mr L. S. Cummins with my B.C. of the 30th June, 1881
C. F. Bolton.
D.S.

(Sig.578.)

ENCLOSURE A TO No 2.

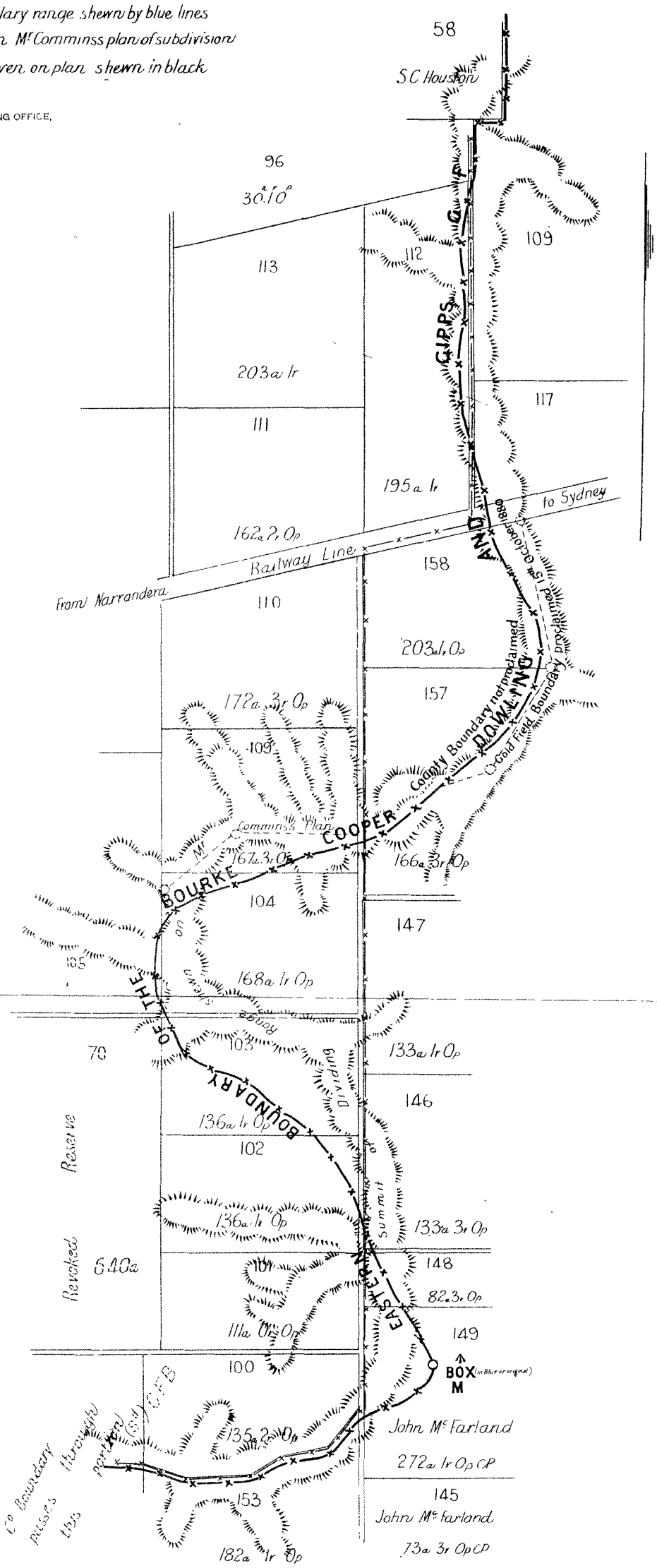
81. 11280 Acres

Copy from

Tracing shewing
the position of dividing range between
Cos. of Bourke and Clarendon
as shewn by M^r L S Commins & by M^r S R M^c Donald

Note
M^r M^c Donalds Survey of C^o boundary range shewn by blue lines
Summit of range sketched from M^r Comminss plan of subdivision
and the County boundary as given on plan shewn in black

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
SYDNEY, NEW SOUTH WALES.



NOTES– The county boundary shewn in Blue on original is on this copy shewn thus —×—×
The note printed along county boundary in Red on original viz EASTERN BOUNDARY OF THE BOURKE COOPER DOWLING AND GIPPS. G.F. is on this copy shewn in the following character **EASTERN**
The notes County boundary not proclaimed and Goldfield boundary proclaimed 15th October 1880 are printed in Red on original
The notes and figures in pencil on original are on this copy shewn in the following characters broken thus. Revoked 640a.
The lines shewn in pencil on original are on this copy shewn thus (- - - - - - - - - - - - -)

Drawn by D Frost
Ex'd by [illegible]

(Sy. 578.)

ENCLOSURE B. TO No. 2

VAR 8° 45' 46" E.

Aln 81/11280

Cat No. B 850 1806

PLAN

of portions Nos 100 to 103 & 105 to 114 (tinted blue on original)

PARISH of KINILIBAH

Co. of BOURKE

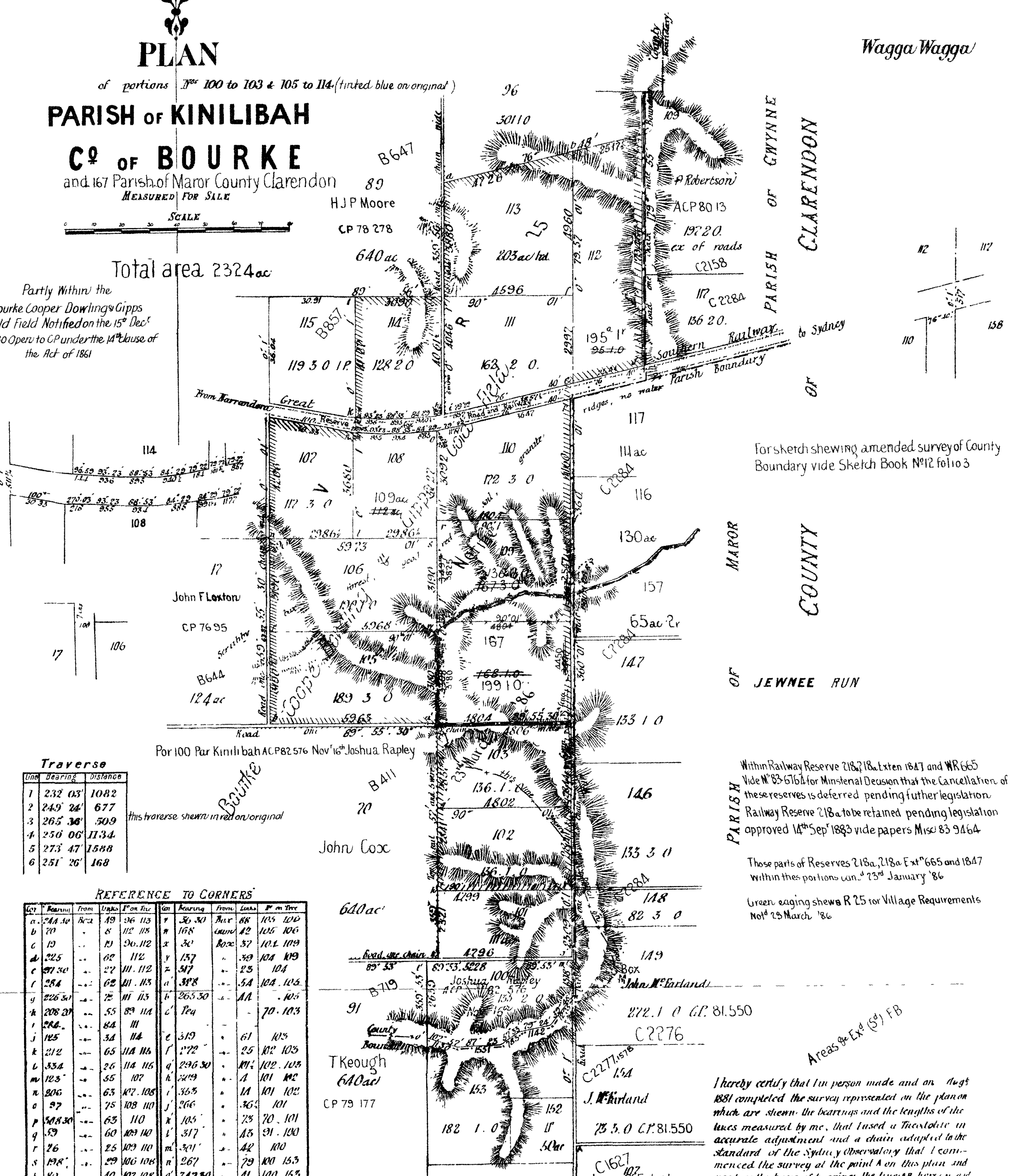
and 167 Parish of Maror County Clarendon

MEASURED FOR SALE

SCALE

Total area 2324 ac

Partly Within the Bourke Cooper Dowling & Gipps Gold Field Notified on the 15th Decr 1880 Open to CP under the 14th clause of the Act of 1861



Wagga Wagga
PARISH OF GWYNNE
CLARENDON
OF COUNTY
PARISH OF MAROR
OF JEWNEE RUN
B647
89
H J P Moore
CP 78 278
640 ac
96
30110
113
25
203 ac hd.
112
P Robertson
ACP 80 13
197 2 0.
ex of roads
C2158
117 C 2284
136 2 0.
115
B857
114
119 3 0 1 P.
128 2 0
111
163 2 0.
195a 1r
Southern Railway to Sydney
Parish Boundary
ridges, no water
From Narrandera
Great
Reserve
Road and Railway
117
111 ac
C2284
116
130 ac
157
65 ac 2 r
147
114
108
107
108
117 3 0
109 ac
110
172 3 0
granite
17
John F Loxton
CP 7695
106
105
B644
124 ac
189 3 0
167
199 1 0
Road
Por 100 Par Kinilibah ACP 82 576 Novr 16th Joshua Rapley
Bourke
B 411
70
John Cox
103
136. 1. 0
102
133 1 0
146
133 3 0
148
82 3 0
149
640 ac
101
100
Joshua Rapley
B719
91
County Boundary
T Keough
640 ac
CP 79 177
153
182 1 0
152
50 ac
Box
John McFarland
272. 1 0 CP. 81.550
C2276
C2277.1578
154
J. McFarland
73. 3. 0 CP. 81.550
C1627
107
James McFarland
Part of CP 81226
160 ac
151 C2284 1578
159 3 0

For sketch shewing amended survey of County Boundary vide Sketch Book No 12 folio 3

Traverse

Line	Bearing	Distance
1	232° 03'	1082
2	249° 24'	677
3	265° 36'	509
4	256° 06'	1134
5	273° 47'	1588
6	251° 26'	168

this traverse shewn in red on original

REFERENCE TO CORNERS

Cor	Bearing	From	Links	No on Tree	Cor	Bearing	From	Links	No on Tree
a	244 30	Box	49	96 113	v	36 30	Box	88	105 106
b	70	"	8	112 113	w	168	Gum	42	105 106
c	19	"	19	96.112	x	30	Box	37	104 109
d	225	"	62	112	y	137	"	39	104 109
e	97 30	"	27	111.112	z	317	"	23	104
f	284	"	62	111.113	a'	328	"	54	104.105
g	226 30	"	75	111 113	b'	265 30	"	44	.105
h	208 30	"	55	89 114	c'	Peg			70.103
i	284	"	84	111					
j	125	"	34	114	e'	319	"	61	103
k	212	"	65	114 115	f'	272	"	25	102 103
l	334	"	26	114 115	g'	296 30	"	10½	102.103
m	123	"	55	107	h'	209	"	4	101 102
n	206	"	63	107.108	i'	353	"	14	101 102
o	97	"	75	108 110	j'	266	"	36½	101
p	308 30	"	63	110	k'	105	"	73	70.101
q	59	"	60	109 110	l'	317	"	43	91.100
r	76	"	25	109 110	m'	301	"	42	100
s	198	"	29	106 108	n'	267	"	79	100 153
t	80	"	40	107 108	o'	347 30	"	41	100.153
u	168	"	62	106 107	p'				
					E	170° 0'	"	12	109 167

Value of improvements. On 103 38½ chains wire fence at 16/- £31 16 0; " 111 40½ £30 7 6; " 104 25 £18 15 0; " 105 12 £9 0 0

Situated in the Maror Run

All old corners found.

Within Railway Reserve 218, 218a Exten 1847 and WR 665 Vide No 83-6764 for Ministerial Decision that the Cancellation of these reserves is deferred pending futher legislation. Railway Reserve 218a to be retained pending legislation approved 14th Sepr 1883 vide papers Misc 83 9464

Those parts of Reserves 218a, 218a Extn 665 and 1847 within thes portions can.d 23rd January '86

Green edging shews R 25 for Village Requirements Notd 23 March '86

Areas & Exd (Sd) FB

I hereby certify that I in person made and on Augt 1881 completed the survey represented on the plan on which are shewn the bearings and the lengths of the lines measured by me, that I used a Theodolite in accurate adjustment and a chain adapted to the standard of the Sydney Observatory that I commenced the survey at the point A on this plan and used as the basis of bearings the line AB hereon and that the whole of the survey has been executed in accordance with the practice of this Department and the regulations published for the guidance of Surveyors. I declare that the above certificate is true in every particular.

Account No 81-66 Passed 9th March 83 4 Sep 11 Con (Sd) W D A.

Transmitted to the Surveyor General with my letter of the 21st October No 81/163

Photo-lithographed at the Government Printing Office

(Sig 578)

That part of County boundary shewn in Red on original is on this copy shewn thus —x—x—

" " edged Green " " " " " " "

Printing in Bed on original is on this copy shewn in the following character thus Keough

Figures " " " " " " " 79.177

Printing " Blue " " " " " " Railway Res

" " Pencil " " " " " " Gold F

(5)

APPENDIX.

6079

(C1463 1578)

PLAN

OF PORTIONS 77 TO 80, 85, 95, 96, 97, 99,

PARISH OF MAROR

ALSO, 48, 49, 52 TO 57, 59, 61 TO 64,

PARISH OF GWYNNE

Co CLARENDON

14 Wagga Wagga

Sale at Wagga-Wagga 27 March 1878
Country lots A to T
Portions 77, 78, 79 85, 95, 96, 97, 99, 48, 49, 52 to 57 59 62 to 64
Vide Aln. 78-5146 lots A B G to J L M P & Q portions 77 78, 97 99
48, 49, 53, 54, 57 & 59 Sold
Lots K, N, O R & S portions 52 55, 56 62, & 63 withdrawn from Sale
Remaining lots not bid for

Reserve 218 to be retained pending legislation approved 14th Sepr 83
Vide papers Ms. 83-9464

That part of R 218a included in Por 79 revoked on 28 Feby 81

Nos 78 79, 80 85, 95, 96, 97 Portions, Ph of Maror
within Railway Reserve No 218 Notified 26th Novr 78

Note.- In the event of the Conditional Purchase (CP 78 40 - No 82) becoming either Lapsed or Forfeited the papers & plan to be forwarded to the Reserve Branch to ascertain if the land is required for any Public Purpose

MEASURED FOR SALE.

Total Area 253 1ac

That part of R256 included in portions 52 53 cancelled 20 July 77

CP 81 7 void for por 61 Vide 81 3321 C S

CP 80 290 void Owen Cooney land being previously applied for

RESERVES 256, AND 552 FOR TRAVELLING STOCK Notified 9 Sepr 73

PARISH OF MAROR.

SCALE

0 10 20 30 40 50 60 Chs

REFERENCE TO CORNERS.

Cor	Bearings	From	Lks	Numbered
38	101	Por	55	60 61
39	328		41	61 62
40	190 30'	"	36	61
41	73	"	41	60 61
42	Chain			62 63
43	180		60	57 58
44	99		69	57
45	344	"	41	56 64
46	320		78	56 57
47	120		100	56 57 58 59
48	133 30'	"	82	58 59
49	170			55 56
50	158	"	26	55 56
51	10	"	30	55 56
52	212	"	75	55
53	159	"	68	54
54	16		63	51 54
55	157	"	53	50 54
56	144 30'	"	65	54
57	180	"	26	53
58	179	"	111	53
59	106	"	48	53 52
60	346	"	53	48
61	168	"	28	49
62	27	"	58	48 54
63	180 30	"	24	52
64				
65	161	"	61	50
66	142	"	111	49 51
67	54	"	28	56
68	274	"	51	49
69	54	"	37	48 49
70	146	"	53	48
71	168	"	28	49
72	27	"	58	48 54
73	180 30	"	24	52

Marked in accordance with Regulations
Transit used in Survey.
Situated on Junee Run.
Granite formation
Open flat forest, good red soil, no water
Date of Survey April May, June '77

Transmitted to the Surveyor General with my letter No 77/38 of 24th July.

A/c 7717 M O C B
Plan accepted 15 Oct'77 M O C B

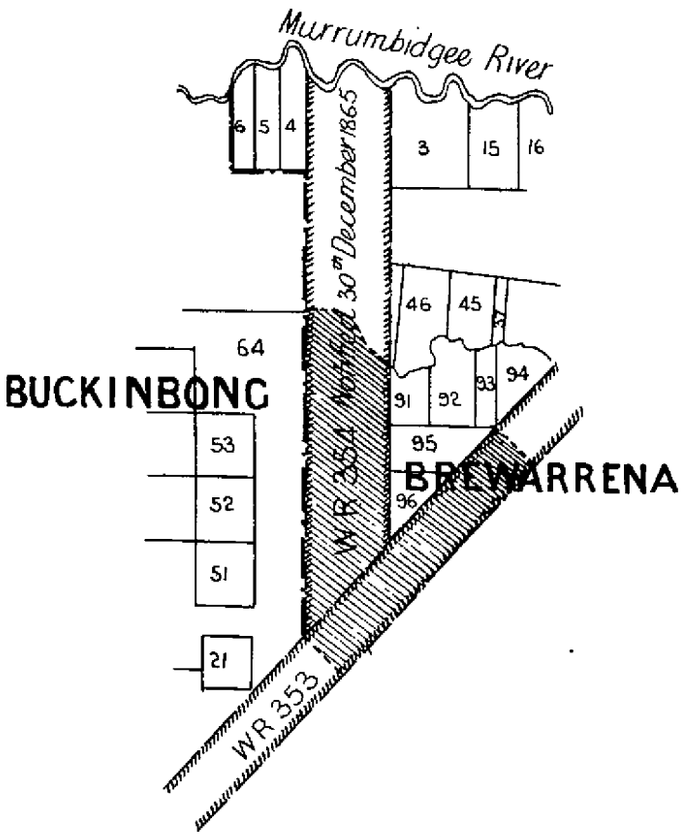
(Sig 578.)

Printing in red on original is on this copy shewn in the following character thus Many
Figures " " " " " " " " " " " " " " 320
Printing in blue " " " " " " " " " " " " Many
" pencil " " " " " " " " " " " " Many
Lines in red " " " " " " " " " " " " ———
Hatching in pencil " " " " " " " " " " " "

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY NEW SOUTH WALES

(6) ENCLOSURE A TO Nº 1

Copy from
Tracing shewing by Red tint
Block on
Brewarrena Run
Pʰ of Brewarrena Cº of Mitchell
being parts of 'W Res 354 and 353

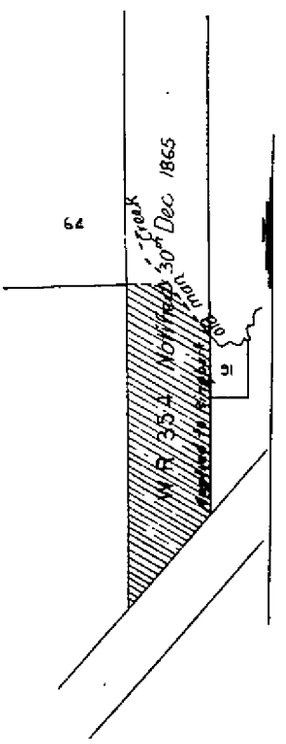


NOTES – That part tinted Red on original is on this copy etched thus
do do edged Green do do . do do do do shewn do
do do shew in pencil on do do do do do do do

(Sig 578.)

(7) ENCLOSURE B TO Nº 1

Copy from tracing



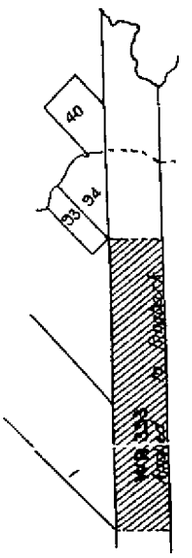
NOTE- That part tinted Red on original is on this copy etched Thus 

(Sig 578.)

(8)

ENCLOSURE TO Nº 2.

Copy from tracing



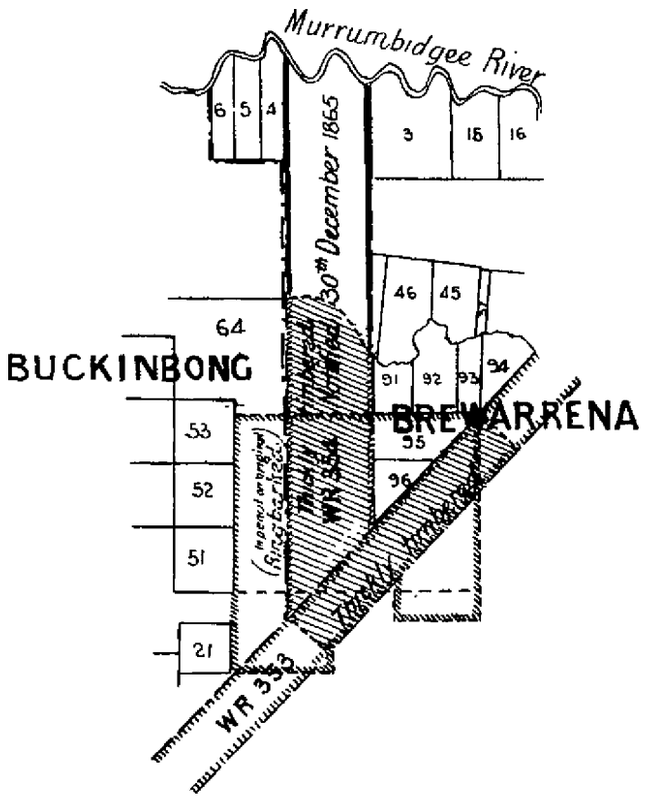
NOTE– That part tinted Red on original is on this copy etched thus

(Sig. 578.)

(9)

ENCLOSURE TO Nº 17.

Copy from
Tracing shewing by Red tint
Block on
Brewarrena Run
Pth of Brewarrena Cº of Mitchell
being parts of WR354 and 353

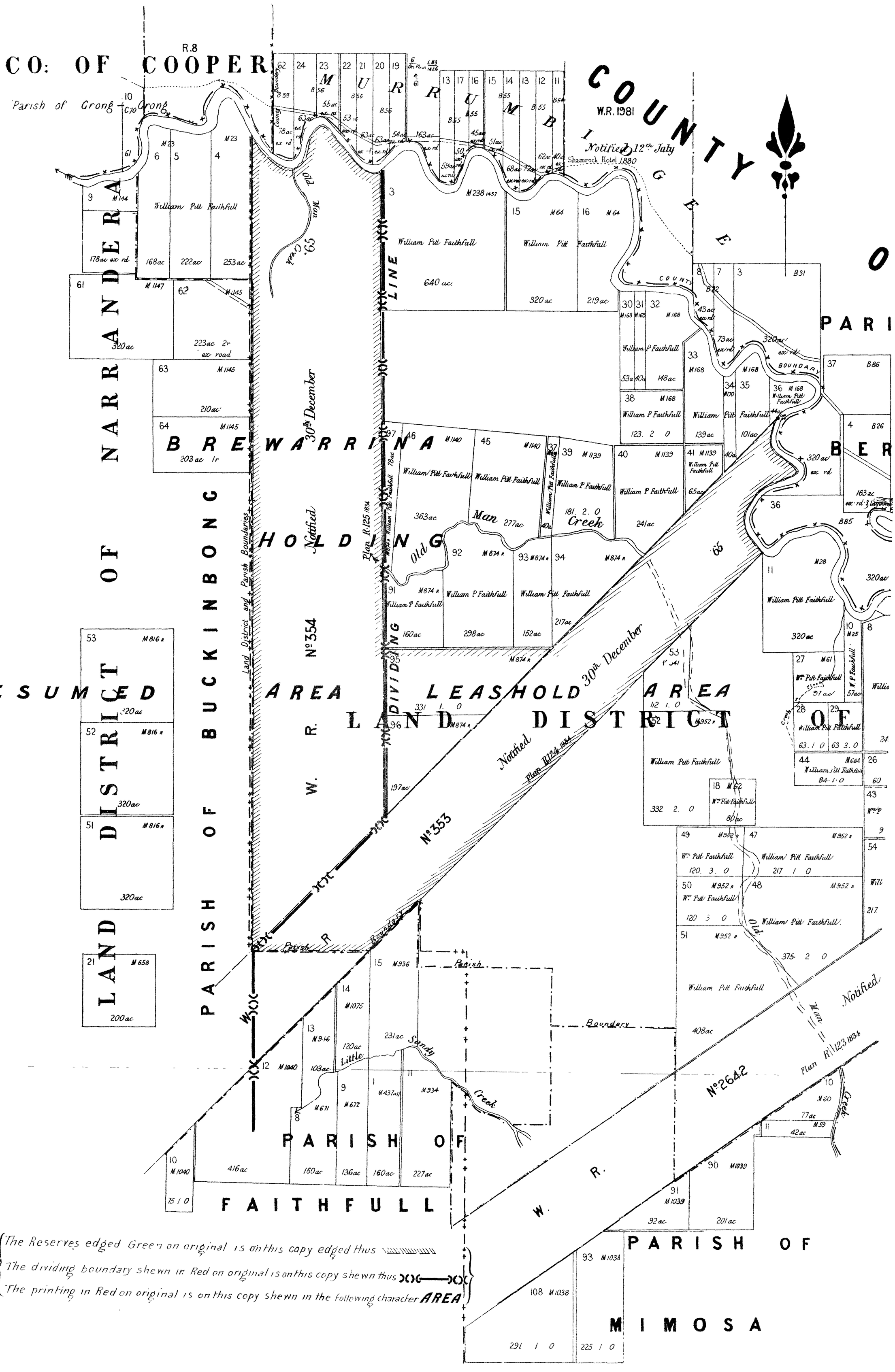


NOTE – That part tinted Red on original is on this copy etched thus
do do edged Green on do do do do do edged thus

(Sig. 578.)

ENCLOSURE TO Nº 21.

Office Nº P 84-138



Note.— The Reserves edged Green on original is on this copy edged thus
The dividing boundary shewn in Red on original is on this copy shewn thus
The printing in Red on original is on this copy shewn in the following character AREA

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES

Transmitted to the Surveyor General with my letter of 19th August Nº 85/44.

(Sig 578.)

(Sd) Arthur. H. Bray
Sur.

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

RESERVES, GUNNEDAH, TAMWORTH, & MURRURUNDI.

(CANCELLED DURING MAY AND JUNE, 1886.)

Ordered by the Legislative Assembly to be printed, 21 *July*, 1886.

[*Laid upon the Table of the House in accordance with promise made by the Honorable the Secretary of Lands in answer to Question No.* 2, *on Votes and Proceedings No.* 77, *of the* 15*th June*, 1886.]

RETURN showing Reserves cancelled, area selected or conditionally leased out of said Reserves, number of applicants for each Reserve and the area apparently available after selection, &c., in the Districts of Gunnedah, Tamworth, and Murrurundi, during the months of May and June, 1886.

(No. 1)

GUNNEDAH.

RETURN showing Reserves cancelled in 1886, areas open in May and June, and number of applicants.

No. of Reserve.	Date of Reservation.	Date of Revocation.	County.	Parish.	Area of Reserve	Area available at date of revocation.	Area alienated to date.	How alienated.	No. of selections.	Balance remaining open	Remarks.
1,220	29 July, 1878	13 Feb., 1886	Pottinger	Breeza ..	1,300	1,300	320	C.P.	2	980	No ballot. Special area.
Part of 1,666	1 Nov., 1880	13 ,, 1886	,, ..	,, .	210	210	Nil.	....	..	210	Special area.
Part of ex. 1,666	1 ,, 1880	13 ,, 1886	,, ..	,, ..	50	50	Nil.	....	..	50	,,
321	11 Mar., 1868	3 April, 1886	Buckland	Wallala..	108	108	108	C.P.C.L.	1	Nil.	One person opposed this applicant at ballot.
327	11 ,, 1868	3 ,, 1886	,, ..	Ferrier	320	320	160	A.C.P.	1	160	No ballot.
720	25 Aug., 1874	3 ,, 1886	,, .	Clift ..	4,700	480	Nil.	. .	..	480	The balance of this Reserve is within Tamworth District
1,145	22 Mar., 1878	3 ,, 1886	,, ..	Wallala..	500	500	500	C.P.	2	Nil.	No ballot.
1,146	22 ,, 1878	3 ,, 1886	,, ..	,, ..	000	120	120	C.L.	1	Nil.	No ballot. 320 acres of this Reserve is covered by C.P. 77–110, and balance by R. R. 1,677.
Ex. 1,146	19 Nov., 1879	3 ,, 1886	,, .	,, ..	100	73	73	C.L.	1	Nil.	No ballot. Balance of this Reserve is covered by W.R. 1,145 (above).
1,003	10 Mar., 1879	3 ,, 1886	,, ..	Denver	1,400	1,400	Nil.	....	..	1,400	
480	20 Dec., 1872	20 Feb., 1876	,, ..	Ferrier ..	380	380	140*	A.C.P.	1	240	No ballot.

POPULATION AREAS which have been cancelled :—

Town of Breeza....	20/3/85, 20/3/86 ;	Buckland, Ferrier ;	6,000 ; 380	acres available on date of cancellation, of which 140* acres now alienated, leaving 240 acres open.									
,, ,, ...		Pottinger ; Breeza ;	 260	,,	,,	,,	,,	nil	,,	,,	260	,,	
,, Boggabri .	20/3/85, 28/10/85 ;	Pottinger ; Boggabri ;	2,600 ; 440	,,	,,	,,	,,	nil	,,	,,	440	,,	
,, Carroll....	20/3/85, 28/10/85 ;	Nandewar ; Boorobil :	2,000 ; 500	,,	,,	,,	,,	nil	,,	,,	500	,,	

(No. 2.)

(No. 2.)

TAMWORTH.

RETURN showing Reserves cancelled, area selected or conditionally leased out of said Reserves, number of applicants for each Reserve, and the area apparently available after selection, &c.

Reserve No.	Date of Reservation.	County.	Parish.	Date of Revocation.	Area revoked.	No of applications lodged.	Area selected or conditionally leased.	If balloted for, name of successful applicant.	Area apparently available.	Remarks.
					acres.		acres.		acres.	
1,242	12 Aug., 1878	Buckland	Evan.....	6 Mar., 1886	160	Nil.	.....	.....	160	No applicants. Leasehold area.
324	11 Mar., 1868	,,	Clift	3 April, 1886	480	1	150	.....	120	Part of the remaining portion of this Reserve, viz., 10 acres, included in C.L. 86-25. Areas open since 3 June, 1886.
456	16 June, 1871	,, ..	,, ...	3 ,, 1886	640	Nil.	.....	.....	640	
Part of 590	12 May, 1874	,, ..	Coeypoly.. .	3 ,, 1886	560	Nil	.. .	.. ..	560	
,, 591	12 ,, 1874	,, ..	,, ...	3 ,, 1886	236	1	236	.....	Nil.	Embraced in J. R. Doolan's C.P. 86-03 and conditional lease 86-49, 250 acres.
,, 602	12 ,, 1874	,, ..	Wallabadah..	3 ,, 1886	180	1	120	.....	60	120 acres taken by J. Johnson, 86-67.
726	24 Aug., 1874	,, ..	Clift	3 ,, 1886	4,700	5	930	....	3,770	930 acres selected by Samuel Clift under C.P.'s 86-62, 63-66, & C.L.'s 86-35 & 36.
Part of 603	12 May, 1874	,, ..	Coeypoly....	3 ,, 1886	660	Nil.	.....	....	560	Open since 3 June, 1886.
,, 1,003	10 Mar., 1879	,, ..	Denver	3 ,, 1886	1,480	Nil.	.....	. .. .	1,480	
,, 1,217	22 July, 1878	,, ..	Piallaway .	3 ,, 1886	1,960	22	1,960	John Daly	.....	Embraced in three applications, John Daly, 640 acres; Anthony Howard, 640 acres, and R. Maguire, jun., 640 acres. C.P. 640 acres, C.L. for the 640 acres fronting the creek; nineteen applications lodged; balloted for; John Daly successful.
1,245	12 Aug., 1879	,, ..	Currabubula.	3 ,, 1886	3,500	7	1,140	C. Brady, junr. ..	2,360	1,140 acres embraced in three applications, Charles Brady, C.P. 640; Michael Daly, C.P. 140 acres, and C.L. 360 ac., 640 acres, name of Charles Brady, four applications lodged; balloted for, C. Brady, junr., successful.
Part of 953	5 Nov., 1875	Darling	N. Barraba ..	27 Feb., 1886	1,300	Nil.	.....	..... .	1,300	Open since 20 April, 1886.
164	3 Aug., 1866 / 1 Oct., 1869	,, ..	Mundowey ..	3 April, 1886	188	Nil.	. ..	. .....	188	Area open during June, 1886.
378	29 July, 1874	,, ..	Nandewar ..	3 ,, 1886	160	1	160	....	.....	160 acres taken by A. S. Darby, C.P. 86-71.
Part of 636	12 May, 1874	,, ..	Keepit	3 ,, 1886	330	3	330	... .	.....	Taken by E. S. Dowe, C.P. and C.L., and C.L. of T. A. Burke.
751	18 Nov., 1874	,, ..	Belmore	3 ,, 1886	880	Nil.	. ...	....	880	Area open since 3 June, 1886.
1,034	14 June, 1876	,, ..	Unknown	3 ,, 1886	1,300	Nil.	.....	. ...	1,300	
Part of 1,064	20 Nov., 1876	,, .	Warrabah ..	3 ,, 1886	560	Nil.	.....	....	560	
,, 1,369	23 Sept., 1879	,, ..	Barraba	3 ,, 1886	1,420	4	1,200	.....	220	C.P. Conrad Simonhause, 200 ac., C.L. 600 ac.; Lewis H. Hyman, 100 ac. & 300 ac. C.L. No conflicting applications.
1,370	21 April, 1879	,, ..	N. Barraba ..	3 ,, 1886	640	Nil.	.... .	....	50	The remainder appears to be embraced in C.L.'s 230 and 569. This area open since 3 June, 1886.
1,375	21 ,, 1879	,, .	Borindi	3 ,, 1886	360	Nil.	.....	.....	360	Open since 3 June, 1886.
1,378	21 ,, 1879	,, ..	Cuerindi	3 ,, 1886	300	Nil.	.....	.....	300	
Part of 1,380	21 ,, 1879	,, ..	Baldwin	3 ,, 1886	880	Nil.	.....	.....	880	
1,384	21 ,, 1879	,, ..	Eumur.....	3 ,, 1886	540	1	540	.....	Nil.	Selected by John Jansen. See C.P. 86-73, C.L. 86-30.
Part of 1,381	21 ,, 1879	,, ..	Dowe	3 ,, 1886	1,280	14	1,280	Pat. Brady, senr.	Nil.	640 acres in name of P. Brady, junr.; ten applicants for land, P. Brady, junr., being successful.
								Pat. Brady, junr.		640 acres in name of Pat. Brady, senr.; four applications lodged, Pat. Brady, senr., being successful.
1,386	21 ,, 1879	,, ..	Fitzroy.....	3 ,, 1886	640	Nil.	.... .	....	640	Open since 3 June, 1886.
1,388	21 ,, 1879	,, ..	Fleming	3 ,, 1886	500	Nil.	.....	. .....	500	
1,389	21 ,, 1879	,, ..	,, ...	3 ,, 1886	640	Nil.	.....	....	.... .	Renotified as reserve No. 7, 29 May, 1886.
1,395	21 ,, 1879	,, ..	Hobden	3 ,, 1886	480	18	180	....	300	Selected by Geo. Winter, 180 ac. Area open since 3 June, 1886.
1,396	21 ,, 1879	,, ..	Keepit	3 ,, 1886	720	6	720	Thos. A. Burke ..	Nil.	The whole area embraced in T. A. Burke's C.P. and C.L., 3 June, 1886. Six applications lodged, T. A. Burke successful.
Part of 1,403	21 ,, 1879	,, ..	Nandewar ..	3 ,, 1886	240	1	200	.....	40	Selected by C. Hansen, C.P. 86-87. Area open since 4 June, 1886.
,, 1,405	21 ,, 1879	,, ..	Newry	3 ,, 1886	840	Nil.	.....	..... .	840	Open since 3 June, 1886.
1,454	7 July, 1879	,, ..	Namoi	3 ,, 1886	264	Nil.	.....	... .	264	
1,617	7 ,, 1879	,, ..	Gulligal	3 ,, 1886	210	2	110	....	100	110 acres selected by T. G. Wiseman, C.P. 86-90; C.L. 86-46.
1,618	7 ,, 1879	,, ..	,, ...	3 ,, 1886	300	Nil.	.....	.....	300	Open since 3 June, 1886.
339	.....	Parry .	Crawney ...	16 Jan., 1886	5	Nil.	.....	.. ..	5	
Population area, Wallabadah	....	Buckland	Wallabadah..	28 Oct., 1885	6,000	9	1,000	Ed. Underwood / David Barnett.	100	The Tamworth portion of Wallabadah population boundary cancelled 28 Oct., 1885, has all been selected except about 100 acres, the remaining portion is in Murrurundi Land District. 400 acres applied for by Ed. Underwood and Geo. Baldock, decided by ballot, Ed. Underwood being successful. *98 acres 3 roods in the name of David Barnett, applied for by three applicants; decided by ballot, David Barnett being successful. The remaining portion selected, except 100 acres.

Area in connection with said Reserves during May and June, 1886, open for selection, &c., 28,048 acres.

(No. 3.)

(No. 3.)

MURRURUNDI.

AREAS of Cancelled Reserves open to selection during the months of May and June, 1886.

No. of Reserve	County.	Parish.	Area open to Selection	Area Selected	No. of applicants for each portion.	Names of successful applicants.	Names of applicants who selected without ballot.	Remarks.
			acres.	acres.				
601	Buckland..	Warrah	432	432	1	....	Andrew Loder.	
1,133	,,	Borambil and Warrah.	960	Nil.	Nil.	.....	....	Made special area and again reserved.
621	,,	Yarramanbah	200	Nil.	Nil.			
713	,,	Telford	61	Nil	Nil.			
714	,,	,, ...	25	Nil.	Nil.			
1,147	,,	Gunnadilly	1,600	1,600	29	Henry Ingall, jnr. and Joseph Perry	. ...	Two separat ballots were taken, first for 1,280 acres; second for 320 acres.
1,607	,,	Warrah	120	120	1	....	Andrew Loder.	
724	Pottinger..	Brothers . ..	1,925	1,078	1	.. ..	Clift Brothers ...	Two applications made, now conflicting, first for 978 acres, and second for 100 acres.
,,	,,	,, .. .	,,	,,	1	....	Charles Delve.	
753	,,	Clift	5,120	1,280	1	.. ..	W. G. Clift.	

POPULATION Areas cancelled and areas open to selection during May and June, 1886.

Name of Reserve.	County.	Parish.	Area open to selection.	Area selected.	Name of selector.
			acres.		
Doughboy Hollow	Buckland	Murrurundi and Temi ..	3,000	Nil.	Nil.
Murulla	Brisbane	Murullah	1,500	Nil.	Nil.
Wallabadah	Buckland.....	Wallabadah	600	Nil.	Nil.

Sydney: Thomas Richards, Government Printer.—1886.

[3d.]

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

RESERVES, GUNNEDAH, TAMWORTH, & MURRURUNDI.

(CANCELLED FROM 1 JANUARY TO 31 MAY, 1886—SUPPLEMENTARY RETURN.)

Ordered by the Legislative Assembly to be printed, 31 *August*, 1886.

LAID upon the Table of the House in accordance with promise made by the Honorable the Secretary for Lands in answer to Question No. 2 on Votes and Proceedings No. 77, of the 15th June, 1886,—

"Supplementary Return showing the area available within the Reserves "cancelled within the Land Districts of Tamworth, Murrurundi, and "Gunnedah, from 1st January to 31st May, 1886."

(*Mr. Copeland.*)

RESERVES, GUNNEDAH, TAMWORTH, AND MURRURUNDI.

No. 1.

SUPPLEMENTARY RETURN showing the area available within the Reserves cancelled within the Land Districts of Tamworth, Murrurundi, and Gunnedah, from 1st January to 31st May, 1886.

Reserve No.	Date of Revocation.	County.	Parish.	Area.	Date of Reservation.	Land District.	Area available when revocation took effect.	Remarks.
	1886.			Acres.			Acres.	
1,242 (part)	6 March	Buckland	Evan	160	12 August, 1878	Tamworth	Nil.	Held under I.P. by L. W. Levy and G. J. Cohen (portion 118).
321 (part)	3 April	"	Wallala	168	11 March, 1868	"	168	Now selected under C.Ps. 86-37 and 86-14 (80 acres each), by W. I. Pickering.
324	3 "	"	Clift	480	11 " "	"	480	150 acres selected under C.P. 86-61 of 3rd June, by S. Clift; and 10 acres as part of C.L. 86-35 of 250 acres, by same applicant.
327	3 "	"	Ferrier	320	11 " "	"	320	160 acres selected under C.P. 86-36 of 3rd June, by Joseph Clift.
456	3 "	"	Clift	640	16 June, 1871	"	640	Still vacant.
590 (part)	3 "	"	Cocypolly	560	12 May, 1874	"	560	Still vacant.
591 (part)	3 "	"	"	236	12 " "	"	236	Now included in J. R. Doolan's C.P. 86-93 (100 acres), and C.L. 86-49 (250 acres) of June 10th.
602 (part)	3 "	"	Wallabadah	180	12 " "	"	180	120 acres selected under C.P. 86-67 of 3rd June, by John Johnson.
603 (part)	3 "	"	Cocypolly	560	12 " "	"	560	Still vacant.
726	3 "	"	Clift, &c.	4,700	25 August, "	"	4,700	930 acres selected by Samuel Clift under C.Ps. 86-62, 63, and 66, and C.Ls. 86-35 and 36.
1,003A Extn. (part)	3 "	"	Denver	1,480	10 March, 1879	"	1,480	Still vacant.
1,145	3 "	"	Wallala	500	22 " 1878	"	500	240 acres selected under C.P. 86-38 of 3rd June, by W. O'Neill; 280 acres gazetted as special area No. 2, 10th April, 1886; and 130 acres of this selected under C.P. 86-40 of 3rd June, by M. O'Neill.
1,146	3 "	"	"	600	17 November, 1879	"	600	Open to C.P. but still stands as R. 152 from Lease, notified 22nd March, 1878.
1,146 Extn. (part)	3 "	"	"	160	17 " "	"	160	Still vacant.
1,217 (part)	3 "	"	Piallaway	1,960	22 July, 1878	"	1,960	1,020 acres selected under three applications, by J. Daly, A. Howard, and R. Maguire.
1,245	3 "	"	Currabubula	3,500	12 August, "	"	3,500	640 acres selected under C.P. 86-78 of 3rd June, by Charles Brady; 140 acres selected under C.P. 86-89 of 3rd June, by M. Daly; 360 acres selected under C.L. 86-44 of 3rd June, by M. Daly.
953 (part)	27 February	Darling	North Barraba	1,300	5 November, 1875	"	1,300	Still vacant.
164 (part)	3 April	"	Mundowey	188	3 August, 1866	"	188	Still vacant.
378	3 "	"	Nandewar	160	1 October, 1869	"	160	Selected under C.P. 86-71 of 3rd June, by A. S. Darby.
636 (part)	3 "	"	Keepit	330	12 May, 1874	"	330	Partly selected under C.P. 86-74 (88¾ acres), and C.L. 86-51 (180 acres) of 3rd June, by E. S. Dowe. Part also included in several conflicting applications.
751 (part)	3 "	"	Belmore	880	18 November, "	"	880	Still vacant.
1,034	3 "	"	"	1,300	14 June, 1876	"	1,300	Partly re-notified 3rd April, 1886, as C. R. No. 4 (150 acres.) Balance still vacant.
1,064 (part)	3 "	"	Warrabah	560	20 November, "	"	560	Still vacant.
1,369 (part)	3 "	"	Barraba	1,420	23 September, 1879	"	1,420	800 acres selected by C. Simshauser under C.P. 86-91 (200 acres), and C.L. 86-48 (600 acres); 400 acres selected by L. H. Hyman under C.P. 86-100 (100 acres), and C.L. 86-53 (300 acres).
1,370	3 "	"	North Barraba	540	21 April, "	"	50	Balance embraced in J. Groth's C.Ls. 230 and 569.

Reserve No.	Date of Revocation.	County.	Parish.	Area.	Date of Reservation.	Land District.	Area available when revocation took effect.	Remarks.
	1886.			Acres.			Acres.	
1,375	3 April	Darling	Borinde	360	21 April, 1879	Tamworth	360	Still vacant.
1,378 (part)	3 „	„	Cuerindi	300	21 „ „	„	300	Still vacant.
1,380 (part)	3 „	„	Baldwin	880	21 „ „	„	880	300 acres gazetted as special area No. 1, 10th April, 1886. Balance apparently vacant.
1,381 (part)	3 „	„	Dowe	1,280	21 „ „	„	1,280	640 acres selected under C.P. 86–75 of 3rd June, by P. Brady, junr.; 640 acres selected under C.P. 86–77 of 3rd June, by P. Brady, senr.
1,384 (part)	3 „	„	Eumur	540	21 „ „	„	540	Selected under C.P. 86–73 and C.L. 86–39 of 3rd June, by John Jansen.
1,386	3 „	„	Fitzroy	640	21 „ „	„	640	Still vacant.
1,388	3 „	„	Flemming	500	21 „ „	„	500	Still vacant.
1,389	3 „	„	„	640	21 „ „	„	Nil.	Re-notified as W.R. No. 7, 29th May, 1886.
1,395	3 „	„	Hobden	480	21 „ „	„	480	160 acres selection under C P 86–96 of 10 June, 1886, by George Winter.
1,396	3 „	„	Keepit	720	21 „ „	„	720	All taken up under several conflicting applications, 3rd June, 1886.
1,403 (part)	3 „	„	Nandewar	240	21 „ „	„	240	200 acres selected under C.P. 86–87 and C.L. 86–42 (100 acres each), by Chas. Hansen.
1,405 (part)	3 „	„	Newry	840	21 „ „	„	840	Still vacant.
1,454	3 „	„	Namoi	264	7 July, „	„	264	Still vacant.
1,617	3 „	„	Gulhgal	210	7 „ „	„	210	110 acres selected under C.P. 86–90 (50 acres) and C.L. 86–8 (60 acres), T. G. Wiseman.
1,618	3 „	„	„	300	7 „ „	„	300	Still vacant.
399 (part)	3 „	Parry	Grawney	5		„	5	
610	3 „	Buckland	Warrah	432	12 May, 1874	Murrurundi	432	Part included in A. Loder's C.P. 86–17 of 3rd June (560 acres), and C.P. 86–26 of 10th June (600 acres).
621	3 „	„	Yarrimanbah	200	12 „ „	„	200	Still vacant.
713	3 „	„	Telford	61	21 July, „	„	61	Still vacant.
714	3 „	„	„	25	21 „ „	„	25	Still vacant.
1,133	3 „	„	Borumbil, &c.	960	22 February, 1878	„	Nil.	Re-notified as W.R. No. 12, 2nd June, 1886.
1,147 (part)	3 „	„	Gunnadilly	1,600	22 March, „	„	1,600	Taken up by several applications, 3rd and 10th June, 1886.
1,607	3 „	„	Warrah	120	21 June, 1880	„	120	Included in C.P. 86–17 of 3rd June (529 acres), by Andrew Loder.
724 (part)	3 „	Pottinger	Brothers	1,925	18 August, 1874	„	1,925	1,118 acres taken up under four applications, 3rd and 10th June, 1886.
753	3 „	„	Clift	5,120	18 November, 1874	„	5,120	Still vacant.
1,275 (part)	3 „	„	Clift, &c.	725	9 September, 1878	„	725	Still vacant.
1,220	13 February	„	Breeza, &c.	1,300	29 July, „	Gunnedah	1,300	Gazetted as special area No. 3, 5th May, 1886, and 480 acres selected under three applications.
1,666 (part)	13 „	„	„	210	1 November, 1880	„	210	Included in special area No. 2, gazetted 5th May, 1886.
1,666 Extn. (part)	13 „	„	„	50	1 „	„	50	Included in special area No. 2, gazetted 5th May, 1886.
					Population Areas.			
Breeza	20 March	Buckland, &c.	Ferrier, &c.	6,000	20 March, 1885	Gunnedah	2,260	1,530 acres gazetted as special areas 3 and 4, 5th May, 1886; 620 acres selected by various applications (480 acres being out of special area No. 3).
	1885.							
Boggabri	28 October	Nandewar, &c.	Boggabri, &c.	2,600	20 „ „	„	500	Still vacant.
Carroll	28 „	Buckland, &c.	Carroll, &c.	2,000	20 „ „	„	630	Still vacant.
	1886.							
Doughboy Hollow	20 March	Brisbane	Murrurundi, &c.	3,000	20 „ „	Murrurundi	2,360	Still vacant.
	1885.							
Murulla	22 October	„	Murulla	1,500	20 „ „	„	1,150	760 acres taken up 24th December, 1885, and 102 acres on 7th January, 1886.
Wallabadah	28 „	Buckland	Wallabadah	6,000	20 „ „	Murrurundi and Tamworth.	4,900	3,850 acres taken up under twenty-four applications since the revocation took effect. About 1,050 acres still available.

Sydney: Thomas Richards, Government Printer.—1886.

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

RESERVE, BOTTLE FOREST.

(APPLICATIONS FOR PORTIONS OF.)

Ordered by the Legislative Assembly to be printed, 20 September, 1886.

[*Return to a Question asked by F. Abigail, Esq., M.P., on the 16th September*, 1886, *respecting Applications for portions of Reserve No. 24, at Bottle Forest.*]

QUESTIONS.

1. The names of the parties who applied for portions of Reserve No. 24, at Bottle Forest?
2. When was the permission granted, and by whom?
3. The number of acres granted, and to whom granted?
4. Is it true that the Honorable Member for Gunnedah, Mr. J. P. Abbott, while Minster for Mines, refused all these applications?
5. Under what conditions were these lands granted?

ANSWERS.

1. John Coghlan, James Birrell, James Robertson, W. F. Mackenzie, Thomas Garrett, Angus Cameron, James Fletcher, junr., W. G. Laidley, Vincent Coghlan, M. C. Cowlishaw, William O'Brien, Thomas Saywell, David Laing, Thomas W. Garrett, R. Prendergast, Andrew Broad, R. P. Davys, C. Sweetland, Thomas Brooks, W. Laing, Charles F. Stokes, W. Edye Mort, A. Ebsworth, R. W. Hogg, R. Reid.
2. 28 September, 1883.—The Honorable J. P. Abbott.
3. 11,743 acres.—Thomas Garrett, John Coghlan, Vincent Coghlan, James Robertson, John Robertson, R. W. Hogg, Henry Clarke, W. M'Millan, Thomas Saywell, W. F. MacDermott, R. P. Davys, Herbert Douglas, Francis Lord, J. R. Peebles, William Laidley, W. Edye Mort, Duncan Clark, John Coghlan, A. H. McCulloch, G. C. Loughnan, E. M. Ebsworth, Alfred Ebsworth, William Neill, John C. Dibbs, John Robertson, J. T. Jamieson, Thomas W. Garrett, G. Stening, R. Prendergast, John Sutherland, M. C. Cowlishaw, Andrew Broad, David Wilson, Angus Cameron, John M'Innes, James Robertson, Robert Reid, Duncan M'Rae, Walter F. Mackenzie, James Fletcher, junr., Thomas Brooks, David Laing, James Birrell, Charles Sweetland, Alexander Brown, C. F. Stokes, William Laing, Henry Law, Daniel O'Connor.
4. No.
5. That they pay 2s. per acre per annum rent until they commence raising coal, and then that they pay sixpence per ton royalty on all coal raised, provided that if the royalty for any quarter do not equal the rent then rent at the above rate has to be paid. There was also a condition that the land should be tested by boring.

[3d.] 909—

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

CITY OF SYDNEY IMPROVEMENT BOARD.

(SIXTH ANNUAL REPORT.)

Ordered by the Legislative Assembly to be printed, 19 *November*, 1885.

City of Sydney Improvement Board,
Offices, No. 35, Castlereagh-street, Sydney, 31 August, 1885.

To the Honorable the Colonial Secretary,—

Sir,

Notwithstanding the many causes (already brought under notice in each former Annual Report, and frequently dwelt upon in other communications since the initiation of the Board in 1879) which exist to limit the beneficial working of the "City of Sydney Improvement Act," so far as the powers of this Board are concerned, members, in now presenting their Sixth Annual Report, are glad to be in a position to state that their services are being more largely availed of than in the earlier years of the Board's existence. Under the present law the Board is of course powerless to act independently, but must be set in motion by appellants, or by the City Corporation, through their officer, the City Building Surveyor.

During the past year 60 (sixty) references from the City Building Surveyor, under the 27th and 29th sections of the Act, and 10 (ten) appeals from owners, under the 7th and 8th sections thereof, have been received and disposed of.

The buildings thus dealt with number 116 (one hundred and sixteen), and necessitated numerous meetings for purposes of inspection, hearing of evidence tendered by owners and occupiers interested, and deliberation. Some of these cases have extended over several sittings, and in others special consideration has been requisite, partly in consequence, in such instances, of the defective construction of the Act and the absence of the necessary machinery for properly exercising the functions conferred upon the Board.

The total number of cases shows a considerable increase upon last year's work, and they exceed the whole number for the first four years inclusively. It is, therefore, satisfactory to observe that the practical business performed has been largely augmented since the transmission of last Annual Report, and that it appears to be rapidly growing.

Ever since the commencement of the working of the Act the Board have recognized the necessity for its amendment, and they have not ceased to bring this fact prominently under notice, and to propose the alterations considered advisable. Several amending Bills, containing, it is thought, many valuable suggestions, have been prepared with this view, and members are still willing that the knowledge acquired during the past six years of the working of the present defective Act, and the amendments which their experience enables them to point out as necessary, may be utilized in such manner as may be thought fit, so as to bring about the much-needed alteration in the law affecting the improvement of the City, both architecturally and sanitarily.

We have the honor to be,
Sir,
Your obedient servants,

BENJ. BACKHOUSE, CHAIRMAN.
W. BAILEY,
FRANK SENIOR,
GEO. EVANS,
CRAIG DIXSON, M.D., F.R.C.S., E.
} MEMBERS.

[3*d.*] 20—

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1885-6.

NEW SOUTH WALES.

CITY OF SYDNEY IMPROVEMENT BOARD.

(SEVENTH ANNUAL REPORT.)

Presented to Parliament by Command.

City of Sydney Improvement Board,
Offices, No. 35, Castlereagh-street, Sydney, 31 August, 1886.

To the Honorable the Colonial Secretary,—

Sir,

The members of the City of Sydney Improvement Board have the honor to present this their Report for the year ended 31st August, 1886.

It will be remembered that the Board have no power to act independently; 43 meetings have, however, been held, and 146 buildings have been dealt with; 75 of these were brought under notice by the City Building Surveyor in 43 references received from that officer, and 71 were considered in connection with 22 appeals made by owners of properties. 41 orders have been issued to the City Building Surveyor, under the 27th and 29th sections of the "City of Sydney Improvement Act," for the taking down, repairing, or securing of various buildings and structures; in numerous instances extensive repairs or alterations to some of the buildings under consideration having been directed, the remainder being entirely condemned.

Of the appeals, 9 were upheld, conditionally upon certain work, repairs, alterations, and improvements, as specified by the Board, being effected; 11 were dismissed, 5 unconditionally, in 2 cases an extension of time being allowed for taking down the buildings, and in 4 other cases a similar privilege was extended conditionally upon temporary repairs, &c., being performed. In 2 cases the appeals were upheld conditionally upon work, repairs, alterations, and improvements being carried out in respect of portions of the buildings brought under notice, but dismissed as regards other parts of such buildings.

It may thus be seen upon comparison with former reports that the work performed by the Board is still increasing, proving the necessity for the continuance of some such body, which should, however, it is believed, possess larger powers more comprehensively defined.

Much good has been effected in spite of the fact that the functions of the Board are partly paralysed (as already pointed out from year to year), chiefly by the inherent defects of the Act, which will, it is earnestly hoped, be amended as soon as possible. Failing this, and in view of the many and serious impediments which obstruct the attempts of the Board to give some substantial and intelligent effect to the evident intention of the framers of the "City of Sydney Improvement Act," the machinery provided for so doing being sadly insufficient, it will become a question for members to consider whether or not they shall continue those efforts.

Their repeated representations on the subject not having yet produced any satisfactory result, the present opportunity is taken of expressing the opinion that the time has arrived when the Board should either be abolished or placed upon a proper footing, as they are still more than ever conscious of the feeling mentioned in their first Annual Report, that, in the face of the difficulties with which they have to contend, satisfactory progress is impossible.

Were

Were they even in a position to better enforce the due exercise of the provisions of the existing Act, a large benefit would be conferred upon the community in the protection afforded, to a certain extent, not only from insecure and dangerous structures, but also from the violation, in a vast number of buildings, both in the centre and outlying portions of the City, of the laws of health, decency, and architectural taste.

The fees paid, in terms of the 12th section of the Act, by appellants and others for distribution amongst the five members constituting the Board, amount to £417 18s., or on an average at the rate of £83 11s. 7d. each member for the year.

It is noticeable that this is the largest amount collected within a similar period since the establishment of the Board, and that the emolument received by members, several of whom are professional men, whose time is valuable, is merely nominal, whilst the duties performed require considerable care, attention, and experience, bearing in mind more particularly the almost unworkable character of the Act, under which they are called upon to adjudicate and to arrive at their decisions.

We have the honor to be,

Sir,

Your obedient servants,

BENJAMIN BACKHOUSE, CHAIRMAN.

WM. BAILEY, J.P.,
CRAIG DIXSON, M.D., F.R.C.S., E.,
GEORGE EVANS,
FRANK SENIOR, J.P.,
} MEMBERS OF BOARD.

Sydney: Thomas Richards, Government Printer.—1886.

[8d.]

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

MUNICIPALITY OF MEREWETHER.

(PETITIONS AND OTHER DOCUMENTS CONNECTED WITH THE RECENT INCORPORATION OF.)

Ordered by the Legislative Assembly to be printed, 24 *March*, 1886.

RETURN to an *Order* made by the Honorable the Legislative Assembly of New South Wales, dated 24th September, 1885, That there be laid upon the Table of this House,—

"Copies of all petitions, investigations, minutes, reports, and all other "documents connected with the recent incorporation of the Municipality "of Merewether."

(Mr. Fletcher.)

TO HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called Lord Augustus Loftus), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

The Petition of the undersigned Residents of the Glebe and Burwood, near Newcastle, in the Colony of New South Wales.

HUMBLY SHOWETH:—

1. That your Petitioners state that upon incorporation they will be liable to be assessed for Municipal Rates in respect of property or household residence.

2. That the boundaries they propose are as follows:—
All that parcel of land containing about one thousand one hundred and fifty acres, situate in the parish of Newcastle, county of Northumberland: Commencing at the southern extremity of the east boundary of Edward Christopher Merewether's nine hundred and fifty acres, and bounded towards part of the south by the summit of a dividing ridge running north-westerly to the west boundary of the last named measurement; thence by a line bearing north to the south-west corner of the village of Adamstown; thence on part of the north and part of the west by the south and east boundaries of that village; thence on the remainder of the north by the south boundary of the Australian Agricultural Company's Grant bearing easterly to the Pacific Ocean; and thence on the east by the waters of the ocean southerly, to the point of commencement.

3. That the population of the proposed Municipality is one thousand six hundred, or thereabouts.

4. That the incorporation of the proposed Municipality would be a great boon to the inhabitants.

Your Petitioners therefore humbly pray that your Excellency would be pleased to take the matter into your favourable consideration, and declare the said area of land to be a Municipal District under the Municipalities Act by the name of the "Municipal District of Merewether."

And your Petitioners, as in duty bound, will ever pray.

281—A

LIST A.

[805 copies—Approximate Cost of Printing (labour and material), £23 11s. 9d.]

LIST A.

We, the undersigned, inhabitants of Burwood and Glebeland, do hereby signify our willingness to be incorporated into a Municipality, to be known as the "Borough of Merewether."

Name.	Address.
Henry Lovell, senr	Burwood
David Ingles	Burwood
Absalom Coleman	Burwood
his Richard × Nash mark	Burwood
William Lacey	Burwood
John Wilson	Burwood
Wm. Newburn	Burwood
Mr. Sowerby	Burwood
Edward Davies	Burwood
Joseph Mather	Burwood
John Jones	Burwood
Israel Pike	Burwood
Joseph Bowtell, junr	Burwood
James Duke	Glebeland
John Blacker	Glebeland
James Davidson	Glebeland
his David × Jones mark	Glebeland
George Kirkwood	Glebeland
Thomas Mascord	Burwood
Mrs. Whilton	Glebe
her Mrs. × Helem mark	Glebeland
Robert Thirlwall	Glebeland
Thomas Wilson	Burwood
Peter Reilly	Burwood
B. Eyton J. Bradwyn	Burwood
William Laing	Newcastle
John Rees	Newcastle
James Greenhalgh	Glebeland
John Colton	Glebeland
John Barnes	Glebeland
Hugh Damison	Glebeland
Mary Bowen	Glebeland
George Bailey	Glebeland
his Thomas × Craig mark	Glebeland
William Smith	Burwood
Francis Clemens	Glebeland
Thomas Phillips	Burwood
Enoch Evans	Burwood
his Evan × Jones mark	Burwood
Henry Lovell, junr	Burwood
his John × Jones mark	Burwood
John Ralbas	Glebeland
William Atwood	Glebeland
Thos. Graham	Burwood
John Blackwell	Burwood
Thomas Campbell	Burwood
his Joseph × Garratt mark	Burwood
John Griffiths	Burwood
William Wilson	Burwood
W. H. Harris	Newcastle
John Gulliver	Burwood
G. F. Wade	Burwood
William Campbell	Burwood
his Dennis × Cronin mark	Burwood
Neil M'Crimmer	Burwood
A. Kedwell	Burwood
James Searl	Burwood
his Robert × Pearce mark	Burwood
John Roberts	Burwood
W. Leary	Junction
John Angov	Burwood

I, Henry Lovell, senior, of Burwood, in the Colony of New South Wales, dealer, do solemnly and sincerely declare that all the signatures included in List "A," contained on the three preceding pages, and affixed to the Petition hereunto annexed, are the genuine signatures of the persons whose signatures they purport to be; and that such persons are persons liable to assessment for Municipal taxes in respect of property or household residence within the boundaries of the proposed Municipal District, as set forth in the said Petition.

HENRY LOVELL, Senr.

Declared at Newcastle, this thirteenth day of September, 1884, before me,—

W. K. Lockhead, J.P.

LIST B.

We, the undersigned, inhabitants of Burwood and Glebeland, do hereby signify our willingness to be incorporated into a Municipality, to be known as the "Borough of Merewether."

George Hall, Glebe
William Findley, household, Burwood
Alice Lingard, leasehold, Burwood
John Dixon, household, Burwood
her Susan × Harding, leasehold, Burwood mark
Edwin Powell, household, Burwood
Elizabeth Squires, leasehold, Burwood
Joseph Rendheur, leaseholder, Burwood
Mary Cheston, leaseholder, Burwood
his William × Hopkins, leasehold, Burwood mark
his Charles × Hogbin, leasehold, Burwood mark
his Hannory × Gindle, household, Burwood mark
Robt. Archibald, leasehold, Burwood
Stephen Powell, householder, Burwood
her Margaret × Robinson, leaseholder, Burwood mark
George Larmouth, household, Burwood
Robert Walton, householder, Burwood
William Taylor, householder, Burwood
Robert Drylie, leasehold, Burwood
William Bower, leasehold, Burwood
Mary Bland, household, Burwood
William Adamthwaite, leasehold, Burwood
William Bowers, junior, leaseholder, Burwood
Robert Baxter, householder, Burwood
Charles Dawes, leaseholder, Burwood
Henry Bell, leaseholder, Burwood
Dougal Masson, household, Burwood
William Rendal, leaseholder, Burwood
John P. David, leaseholder, Burwood
George Fox, householder, Burwood

William

William Hunter, leaseholder, Burwood
George H. Fenwick, householder, Burwood
William Spencer, leaseholder, Burwood
William Brown, leaseholder, Burwood
Robert Hamilton, leaseholder, Burwood
James Phillips, leaseholder, Burwood
Charles Wilkins, leaseholder, Burwood
his
John × Kembrey, leaseholder, Burwood
mark
Alexander Faulds, householder, Burwood
Christopher Dixon, leaseholder, Burwood
Joseph Whittle, leasehold, Burwood
Esau Whittle, householder, Burwood
Thomas Hogarth, leaseholder, Burwood
Thomas Poole, leaseholder, Burwood
George Jones, leaseholder, Burwood
John Perry, leaseholder, Burwood
Robert Thompson, householder, Burwood
George Colquhoun, leaseholder, Burwood
James Kingloch, leaseholder, Burwood
Hugh Montgomery, householder, Burwood
John Young, householder, Burwood
Jenkin Williams, leaseholder, Burwood
James Reid, leasehold, Burwood
Thomas Irving, householder, Burwood

I, David Ingles, of Burwood, in the Colony of New South Wales, miner, do solemnly and sincerely declare that all the signatures included in List "B," contained on the two preceding pages, and affixed to the Petition hereunto annexed, are the genuine signatures of the persons whose signatures they purport to be; and that such persons are persons liable to assessment for Municipal taxes in respect of property or household residence within the boundaries of the proposed Municipal District as set forth in the said Petition.

Declared at Newcastle, this thirteenth day of September, 1884, before me,— } DAVID INGLIS.

W. K. LOCKHEAD, J.P.

LIST C.

WE, the undersigned, inhabitants of Burwood and Glebeland, do hereby signify our willingness to be incorporated into a Municipality, to be known as the "Borough of Merewether."

Samuel Jones, Burwood
his
William × Banfield, Glebeland
mark
James Noble, Burwood
Alexander Watson, Burwood
Bartholomew Scott, Glebe
John Griffiths, Burwood
William Donne, Burwood
Andrew Baxter, Burwood
James Stanners, Glebeland
John T. Phillips, Burwood
Joseph Britain, Burwood
James Wood, Burwood
Benjamin Smith, Burwood
Thos. T. Weaver, Burwood
William Burchill, Burwood
Anthony Wardle, Burwood
William M'Gee, Burwood
her
Kate Isabella × Read, Glebeland
mark
George Cooper, Glebeland
William Hobson, Glebeland
Thomas Griffiths, Glebeland
his
Thomas × Humphrys, Glebeland
mark
Pete M'Labeen, Glebeland
Alexander Burns, Glebeland
Robert Minnican, Glebeland
John Finlayson, Glebeland
C. Morherne, Burwood
Ralph Paul, Burwood
J. Frederick Loveday, Glebeland
his
William × Kirkwood, Burwood
mark
Robert Cragg, Glebeland
Luke Mason, Burwood
F. Allinson, Burwood
George M'Ghee, Glebeland
John Evans, Burwood
Edwin James, Burwood
Robert Campbell, Glebeland

I, Samuel Jones, of Burwood, in the Colony of New South Wales, miner, do solemnly and sincerely declare that all the signatures included in List "C," contained on the preceding page and affixed to the petition hereunto annexed, are the genuine signatures of persons whose signatures they purport to be, and that such persons are persons liable to assessment for Municipal taxes in respect of property or household residence within the boundaries of the proposed Municipal District, as set forth in the said Petition.

Declared at Newcastle, this thirteenth day of September, 1884, before me,— } SAMUEL JONES.

W. K. LOCKHEAD, J.P.

LIST D.

WE, the undersigned, inhabitants of Burwood and Glebeland, do hereby signify our willingness to be incorporated into a Municipality, to be known as the "Borough of Merewether."

Robert Buxton, Glebeland, householder
Robert Simpson, Glebeland, leasehold
Jno. Roberts, Glebeland, leasehold
his
Richard × Gill, Glebeland, householder
mark
Samuel Boon, Glebeland, leasehold
George Haywood, Glebeland, leaseholder
Joseph Boon, Glebeland, leaseholder
James Russell, Glebeland, householder
William Merriman, Glebeland, leaseholder
his
Thomas × Lewis, Glebeland, leaseholder
mark
Gilbert Anderson, Glebeland, leaseholder
John Jones, Glebeland, householder
Albert Jones, Glebeland, householder
his
Patrick × Dwyer, Burwood, leasehold
mark
James Mouter, Glebeland, householder
John Dowling, Glebeland, leaseholder
Thomas Winterburn, Glebeland, leaseholder
William Lewis, Glebeland, householder
William Forsyth, Glebeland, leaseholder
his
James × Lindsay, Glebeland, householder
mark

James

James Hepburn, Glebeland, household
Tom Harvey, Glebeland, leaseholder
Stephen Powell, Glebeland, leaseholder
his
John × Tovey, Glebeland, household
mark
Joseph Lewis
his
Henry × Daniel, Glebeland, householder
mark
Edward Stallard, Glebeland, leaseholder
Thomas Terris, Glebeland, leaseholder
A. Liechenkamp, Glebeland, householder
Timothy Hayes, Burwood
John Gray, Glebeland, householder
D. Hutchinson
James Wilson, Glebeland, householder
Edwar. Shillar, Burwood, lease
his
John × Powell, Glebeland, leaseholder
mark
John Crawley, Glebeland, leaseholder
Henry Burns, Glebeland, householder
Lewis Crawley, Glebeland, leaseholder
David Thomas, Glebeland, leaseholder
G. Browne, Burwood, leasehold
John Allanson, Glebeland, leasehold
David Williams, Burwood, householder
Mathias Abbott, Burwood, householder

I, Edward Buxton, of Glebeland, in the Colony of New South Wales, miner, do solemnly and sincerely declare that all the signatures included in List "D," contained on the two preceding pages, and affixed to the Petition hereunto annexed, are the genuine signatures of the persons whose signatures they purport to be; and that such persons are persons liable to assessment for Municipal taxes in respect of property or household residence within the boundaries of the proposed Municipal District, as set forth in the said Petition.

EDWARD BUXTON.

Declared at Newcastle, this thirteenth day of September, 1884, before me,—

W. K. Lockhead, J.P.

LIST E.

We, the undersigned, inhabitants of Burwood and Glebeland, do hereby signify our willingness to be incorporated into a Municipality, to be known as the "Borough of Merewether."

William Powell, Burwood, leaseholder
Daniel Curtin, Burwood, leaseholder
Willoughby H. Sutton, Burwood, leaseholder
Jno. Watkins, Burwood, leaseholder
William Young, Burwood, leaseholder
Martin Doohan, Burwood
John Kennedy, Burwood, leasehold
Robert Scott, householder
Mrs. R. Hunter, leaseholder
John W. Richardson, leaseholder
Walter Williamson, Burwood
Thos. Fairleigh, Burwood, leaseholder
Samuel Pollard, Burwood
Robert Coulson, Burwood
Henry Ball, Burwood
Alexander Yearmer, Burwood
Alexr. Patrick, Burwood
David Wilson, Junction, Burwood
Joseph Littlefair, Burwood, leaseholder
Thomas Shaw, leaseholder
Henry Caldwell, Burwood
James Hookway, Burwood
Edwin Porter, Burwood
John Sharp, Burwood
Edward Relph, Burwood

We, Daniel Curtin and John Griffiths, both of Burwood, in the Colony of New South Wales, miners, do solemnly and sincerely declare that all the signatures included in List "E," contained on the preceding page, and affixed to the Petition hereunto annexed, are the genuine signatures of the persons whose signatures they purport to be, and that such persons are persons liable to assessment for Municipal taxes in respect of property or household residence within the boundaries of the proposed Municipal District, as set forth in the said Petition.

DANIEL CURTIN.
JOHN GRIFFITHS.

Declared at Newcastle, this thirteenth day of September, 1884, before me,—

W. K. Lockhead, J.P.

LIST F.

We, the undersigned, inhabitants of Burwood and Glebeland, do hereby signify our willingness to be incorporated into a Municipality, to be known as the "Borough of Merewether."

Abel Sage, Burwood
James Hookookway, Burwood
Thomas Price, Burwood
Samuel Davies, Burwood
John J. Williams, Burwood
Henry Bruniges, Burwood
Matthew Wilbraham, Burwood
Alexander Goodwin, Burwood
John Ballander, Burwood
John Coulson, Burwood
George Wigmore, Burwood
his
George × Coleman, Burwood
mark.
Jonathan Dixon, Burwood
his
William × Jenkins, Burwood
mark.
J. Thomson, Burwood
Samuel Hughes, Burwood
Charles Winsor, Burwood
Joseph Lervey, Burwood
Wm. H. Smith, Burwood
George M'Lennan, Burwood
Samuel Bruniges, Burwood
Henry Hanson, Burwood
Thomas Hanly, Burwood
George Lennon, Burwood
his
Thomas × Maddecott, Burwood
mark.
his
David × Humphrey, Burwood
mark.
James Falvey, Burwood
Thomas Wilson Burwood
his
Charles × Cooke, Burwood
mark.
John Roarty, Burwood
William Rowland, Burwood
his
John × Wood, Burwood
mark.
Caleb Jones, householder, Burwood

I,

I, Thomas Price, of Burwood, in the Colony of New South Wales, miner, do solemnly and sincerely declare that all the signatures included in List "F," contained on the two preceding pages, and affixed to the Petition hereunto annexed, are the genuine signatures of the persons whose signatures they purport to be; and that such persons are persons liable to assessment for Municipal taxes in respect of property or household residence within the boundaries of the proposed Municipal District, as set forth in the said Petition. THOMAS PRICE.

Declared at Newcastle, this thirteenth day of September, 1884, before me,—

W. K. LOCKHEAD, J.P.

Chief Clerk for report.—C.W., 16/9/84.

In proper form. The proposed name of the Municipality, *i.e.*, "Merewether Municipality," will of course be altered to "Municipal District" in the Proclamation.—16/9/84. Prepare Minute for Executive Council, 16/19/84. Herewith, 17.

Minute Paper for the Executive Council.

MEREWETHER—PETITION FOR INCORPORATION.

Colonial Secretary's Office, Sydney, 17 September, 1884.

I RECOMMEND the publication in accordance with section 10 of the "Municipalities Act of 1867" of the substance and prayer of the accompanying Petition signed by 243 persons, who would upon incorporation be liable to be assessed for Municipal taxes in respect of property or household within certain boundaries therein set out, praying that the area so defined may be constituted under the above cited Act a Municipality under the name of the Municipal District of Merewether. ALEX. STUART.

Minute of Executive Council.

THE Executive Council advise that the substance and prayer of the Petition herewith submitted for the incorporation of "Merewether" in terms of the "Municipalities Act of 1867," be published in the manner prescribed by the 10th section of the said Act. ALEX. C. BUDGE,

Clerk of the Council.

Approved.—A.L., 23/9/83. Min. 84/40, 23/9/84.—Confirmed, 30/9/84.

Published in Supplementary *Government Gazette*, No. 486, of 24th September, 1884; *Newcastle Herald* and *Newcastle Despatch*, 30th September, 1884.

SUPPLEMENTARY List of Signatures to Petition from Residents of Burwood and Glebeland for incorporation of Merewether as a Municipality.

Presented by Mr. Ninian Melville, M.P.

LIST G.

WE, the undersigned, inhabitants of Burwood and Glebeland, do hereby signify our willingness to be incorporated into a Municipality, to be known as the "Municipal District of Merewether," in terms of Petition to that intent published in the *Supplementary Government Gazette* of 24th September, 1884.

Name.	Address.	Name.	Address.
William Duncanson	Burwood	James James	Glebeland
Edwin James	Burwood	William Hamilton	Glebeland
William James	Burwood	Stephen Sehlang	Senot
Robert Craig	Burwood	Tom Peters	Burwood
Luke Mason	Burwood	John Halliday	Junction
his Francis × Allinson mark.	Burwood	William Bruniges	Burwood
		John Evans	Burwood
		Ralph Paul	Glebeland
William Kirkwood	Glebeland	his Robert × Campbell mark	Glebeland
George M'Ghee	Glebeland		
his Walter × M'Intyre mark.	Glebeland	Alexander Slaughter	Glebeland
		William Lewis	Glebeland

I, Henry Lovell, of Burwood, in the Colony of New South Wales, dealer, do solemnly and sincerely declare that all the signatures contained on this page, marked G, as above, and affixed to the Petition hereunto annexed, are the genuine signatures of the persons whose signatures they purport to be, and that such persons are persons liable to assessment for Municipal taxes in respect of property or household residence within the boundaries of the proposed Municipal district, as set forth in the said Petition.

Declared at Newcastle, this twenty-fourth day of October, A.D. 1884, before me,— HENRY LOVELL.

ALEXANDER BROWN, J.P.

LIST H.

WE, the undersigned, inhabitants of Burwood and Glebeland, do hereby signify our willingness to be incorporated into a Municipality, to be known as the "Municipal District of Merewether," in terms of the Petition to that intent published in *Supplementary Gazette* on 24th September, 1884.

Oliver Pickles	leaseholder	Burwood	William Jones	householder	Burwood
Thomas Davies	householder	Glebeland	Joshua Liddell	do	Burwood
Frederick King	leaseholder	Burwood	Mark Johnson	householder	Burwood
his John × Wilson mark	leaseholder	Burwood	George Donald	leaseholder	Burwood
			Alexander Johnstone his	householder	Burwood
William Rudge	householder	Glebeland	William × Bradley mark	leaseholder	Burwood

I, David Inglis, of Burwood, in the Colony of New South Wales, miner, do solemnly and sincerely declare that all the above signatures affixed to the Petition, and marked H, and hereunto annexed, are the genuine signatures of the persons whose signatures they purport to be, and that such persons are persons liable to assessment for Municipal taxes in respect of property or household residence within the boundaries of the proposed Municipal district, as set forth in the said Petition.

Declared at Newcastle, this twentieth day of December, A.D. 1884, before me,— } DAVID INGLIS.

W. H. SHAW, J.P.

Chief Clerk for report, 4/11/84.

If the names were submitted in a supplementary Petition for incorporation, they could be treated as additional to original Petition, but as there has been no counter petition, and three months publication of the substance of the Petition expires on 20th instant, I think that no notice need be taken of the additional names submitted.—19/12/84. Prepare minute for publication.—C.W., 22/12/84. Herewith, 22/12/86.

Mr. A. Lindsay to The Principal Under Secretary.

Dear Sir, Patrick-street, Newcastle, 22 December, 1884.

Would you kindly advise up to what time you will be able to receive from me the counter Petition I am now getting signed against the incorporation of this place to be called the Municipal District of Merewether.

By so doing you will much oblige. Yours, &c.,

ALEXANDER LINDSAY.

Minute Paper for the Executive Council.

MEREWETHER—PETITION FOR INCORPORATION OF.

Colonial Secretary's Office, Sydney, 22 December, 1884.

REFERRING to the minute of the Executive Council of the 23rd September last, authorising the publication, in accordance with the "Municipalities Act of 1867," of the substance and prayer of a Petition praying that a certain area might be constituted under the above cited Act a Municipality under the name of the "Municipal District of Merewether," I now recommend the publication in like manner of the accompanying supplementary list of persons in favour of the proposed incorporation.

WILLIAM B. DALLEY.

Minute of Executive Council.

THE Executive Council advise that the publication of the supplementary Petition, herewith submitted, be published as herein recommended.

ALEX. C. BUDGE,
Clerk of the Council.

Approved.—A.L., 23/12/84. Min. 84–57, 23/12/84.—Confirmed, 30/12/84.

Published in Supplementary Gazette, No. 39, of 28th January, 1885, *Newcastle Herald* and *Newcastle Despatch*, 31st January, 1885.

Counter Petition against Incorporation of proposed Municipality of Merewether.

To His Excellency the Right Honorable Lord Augustus William Frederick Spencer Loftus, Knight Grand Cross of the Most Honorable Order of the Bath, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

The humble Counter Petition of the undersigned,—

Respectfully sheweth,—

1. That your counter Petitioners learn a Petition was lately presented to your Excellency, under the provisions of the Municipalities Act of 1867, from a number of persons praying for the incorporation under the title of the Municipal District of Merewether, of certain lands therein defined.

2. That your counter Petitioners are informed, and do believe that with the exception of 32 (thirty-two) acres or thereabouts, the property of the Church of England, Newcastle, the whole of the lands proposed to be incorporated are the property of Edward Christopher Merewether.

3. That the Petitioners for incorporation and your counter Petitioners are either tenants of the Glebelands without fixity of tenure or leaseholders from said Edward C. Merewether, and that the majority of the leases have only short terms to run; that in some instances new leases have been issued on longer terms; but your counter Petitioners consider the conditions of same prohibitory, besides providing for an increased rent equal to (166½) one hundred and sixty-six and a half per cent. over the previous rental.

4. That the Glebeland tenants have not as yet received any lease although they have been located on the said lands seven or eight years, and although they understood previous to settling thereon that a lease for (21) twenty-one years would be given as an inducement for them to build, but now the authorities of the said Church wholly refuse and neglect to grant such leases in accordance with promise made.

5. That the population of the proposed Municipal District is chiefly a mining population, and the people generally of the poorer classes.

6. That with very few exceptions the buildings on the land proposed to be incorporated are of the simplest construction, and most unsubstantial character, and have in nearly all cases been built by the tenants themselves, some under lease for a term of years, and a great many under no fixed tenure.

7. That an admirably kept main road runs immediately past the centre of population in the proposed Municipal District, and funds for keeping the said road in good repair have been voted by the Government, and can now or at any future period be operated upon by the Road Superintendent.

8. That your counter Petitioners, being chiefly lessees, would reap no benefit by the proposed incorporation, and would be taxed to enhance the value of the fee simple.

9. Your counter Petitioners further allege that a number of the signatures to the before-mentioned Petition were obtained by misrepresentation, and that a number of the said signatures were given in ignorance

ignorance of the nature and effect of the said Petition, that several hold no such qualification as entered in said Petition, and lastly, that others have signed twice.

Your counter Petitioners therefore humbly pray,—

That your Excellency will be pleased to refuse to declare the aforesaid District as incorporated under the said Act.

And that your Excellency will be pleased to cause such enquiry to be made with respect to the allegations set out in the ninth clause of the counter Petition herein contained as may to your Excellency seem necessary in that behalf.

And your counter Petitioners, as in duty bound, will ever pray.

Name.	Qualification.	Residence.
his Daniel × Conway mark	householder...	Burwood
Henrietta Doohan	leaseholder ...	do
John Taylor	do ...	do
her Margaret × Conway mark	leaseholder ...	Burwood
Daniel Griffiths	householder...	do
Crispher Bell	do ...	do
Jhn. John Gilmore	do ...	do
Robert Moodie	do ...	do
Alexander Farmer	householder...	do
William Young	leaseholder ...	do
his John × Williams mark	do ...	do
John Sharp	do ...	do
Jno. Watkins	do ...	do
Albert Ford	do ...	do
Chas. W. Jenkins	householder...	do
William Ashford	leaseholder ...	do
William A. Richards	householder...	do
Joshua Garfoot	do ...	do
Peter Banks	leaseholder ...	Burwood
A. Livingstone	householder...	do
his Alexander × M'Luckie.. mark	leaseholder ...	do
George Duncan	do ...	do
Thomas Summers	householder...	do
Samuel Pollard	householder...	do
R. Cowie	do ...	do
Timothy Sullivan	leaseholder ...	do
Robert Coulson	householder...	do
William Davies	do ...	do
William Summers	householder...	do
Job Carpenter	leaseholder ...	do
John Konnedy	leaseholder ...	do
John Robins	do ...	do
Ezekiel Davies	leaseholder ...	do
John Morris	do ...	do
David Boyd	householder...	do
John Duncan	race do ...	do
his William × Hicks mark	do ...	do
John Bryant	leaseholder ...	Burwood
his Thomas × Hornby mark	leaseholder ...	do
Joseph Patk. J. Byrne...	householder...	do
his Michael × Burns mark	leaseholder ...	do
Fredk. Talbot	do ...	do
Joseph Littlefair	leaseholder ...	
David Wilson	do ...	do
John Ballenden	do ...	do
Hugh Close	do ...	do
Thomas Richards	do ...	
Thomas Powell	leaseholder ...	Glebeland
Ellen Sangster	householder...	do
Margaret Campbell	do ...	do
William Grant	leaseholder ...	
John Shirley		
Alex. Ross	do ...	do
Fred. Poole	householder...	do

Name.	Qualification.	Residence.
his Thomas × Griffiths mark	leaseholder ...	Glebeland
Richard Crawley	householder...	do
William Hunter	householder...	do
Alexander Goodwin	leaseholder ...	Burwood
Christopher Elgey	lease do ...	Glebeland
Charles Blacknell	householder...	do
his Samuel × Knowles mark	leaseholder ...	do
Randal Thomas	householder...	do
Robert Watt	do ...	do
Samuel M'Roberts	do ...	do
Thomas Smith	leaseholder ...	do
John Finlayson	householder...	do
H. Burns	householder...	do
his Charles × Durbin mark	do ...	do
Thomas Green	do ...	do
E. J. Bottoll	do ...	do
Thomas Evans	do ...	do
James James		
George Hale		
John Jenkins		
Robert Patterson	do ...	do
Matthew Robson	do ...	
John Allanson	leaseholder ...	Glebeland
Wm. Rae	householder...	do
James Prosser	do ...	do
her Lydia × Nurch mark	leaseholder ...	do
his William × Gill mark	do ...	do
George Colly	do ...	do
Caroline Smatell	householder...	do
David Hutchinson	leaseholder ...	do
Minnie Smatell	householder...	do
Walter McIntyre	do ...	do
his John × Tobey mark	leaseholder ...	do
Arthur Benton	do ...	do
James Buchanan	do ...	do
Jonah Crook	householder...	do
William Burchill	do ...	do
his Daniel × Phillips mark	do ...	do
Hugh Robertson	do ...	do
his Patrick × Dwyer mark	do ...	Burwood
Richard Bryant	leasehold ...	Glebeland
Henry Robinson	householder...	do
William Gall	do ...	do
James Duncan	leaseholder ...	Burwood
Francis Thomson	do ...	do
James Stanners	householder...	Glebeland
his Robert × Hughes mark	leaseholder ...	Burwood
William Lewis	householder...	Glebeland
Stephen Powell	do ...	do
Thomas Lindsay	leaseholder ...	Burwood

Thomas

Name.	Qualification.	Residence.
Thomas McCase	leaseholder	Burwood
Francis Thompson	do	do
Margaret Fenwick	householder	do
John Gregory	leaseholder	do
William Henry Powell	do	Glebeland
Edward Stullacey	leaseholder	Burwood
Carl Schneider	do	do
William Diezel	householder	do
James Gregory	do	Burwood
Margaret Lindsay	leaseholder	Glebeland
his David × Williams mark	householder	Burwood
Nels Larsan	do	Glebeland
Alfred Messeder	leaseholder	do
Lewis Crawly	do	do
William Jones	do	do
his John × Powell mark	do	do
her Sarah × Tucker mark	do	do
William Gibson	householder	Glebeland
Elizabeth Gibson	leaseholder	do
A. Lieshenkœmp	householder	do
J. Higgins	do	do
Thomas Campbell	do	do
Robert Nugent	do	do
Mary Wilmott	leaseholder	do
George Grant	householder	do
James Lacey	leaseholder	do
his Enoch × Smith mark	do	do
Thomas Griffiths	do	Burwood
John Gardner	householder	Glebeland
William Cox	leaseholder	do
Thomas Sheldon	householder	do
Hugh Johnston	leaseholder	do
James Charlton	do	do
William Nugent	do	do
William Atwood	do	do
his William × Wilmot mark	do	do
Gilbert Anderson	leaseholder	do
his John × Parsons mark	do	do
William Jarvis	householder	do
Niels Bartholin Hansen	leaseholder	do
his Ambrose × John mark	do	do
James Dart	leaseholder	Newcastle
Guy Stewart	do	do
his William × Attwood mark	do	Glebeland
her Mary × Bland mark	do	do
William Howarth	do	do
Louis Crawley	householder	do
J. Crawley	do	do
his Richard × Gills mark	leaseholder	Glebeland
his John × Conway mark	leaseholder	Burwood
John Conway, jun.	do	Glebeland
her Martha × Cleaves mark	do	Burwood
Richard Wakefield	do	Glebeland
Isaac Cleaves	do	do

Name.	Qualification.	Residence.
William Mills	leaseholder	Burwood
Robert Walton	householder	do
William Lewis	householder	do
John Mitchell	do	do
Andrew Curry	leaseholder	Glebeland
Peter Penman	householder	do
Alex. Mathieson	do	Burwood
James Clayton	do	Burwood
Ferd. Schneider	leaseholder	do
John Curry	do	Glebeland
Fred. Mitchell	householder	do
John Fisher	do	do
Benjamin Williams	do	do
her Margaret × Fisher mark	leaseholder	do
Anthony Waddle	householder	do
George Thompson	leaseholder	Burwood
John Vasey	householder	do
Joseph Orr	leaseholder	do
James Bennett	householder	do
William Hunter	leaseholder	do
Thomas Bland	householder	do
Joseph Bamtell, senior	leaseholder	do
Charlotte Hardes	leaseholder	do
his David × Jones mark	do	Glebeland
N. Rees	leaseholder	Burwood
John Date	do	Glebeland
John Rabbas	householder	do
his Thomas × Craig mark	leaseholder	do
E. Stollard	do	do
his Jeremiah × Kelher mark	do	Glebeland
his Joseph × Ritchie mark	do	do
William Rudge	householder	do
Joshua Davis	leaseholder	Burwood
John Blacker	householder	Glebeland
his Peter × Fisher mark	leaseholder	do
Hugh Dawson	leaseholder	do
T. Findley	do	do
Geo. Hamence	do	do
Richard Baxter	householder	do
his William × Hunter mark	leaseholder	Burwood
George Dulley	leaseholder	do
Stephen Scharg	leaseholder	do
W. H. Sutton	do	do
James Colgan	do	Glebeland
John G. Stephenson	do	do
William Rendal	do	Burwood
his John × Jones mark	do	do
Thomas Garfoot	do	do
Edward Tullins	householder	do
Henry Michell	do	do
Robert Stevenson	do	do
Robert Thomson	do	Glebeland
Joseph Bowtell, junior	householder	Burwood
Tho. Graham	leaseholder	do
his Thomas × Philips mark	do	do
John Blackwell	do	do
George Kirkwood	householder	Glebeland
Alexander Lindsay	leaseholder	do
George Searle	householder	do
Jane W. Searle	leaseholder	do

William

Name.	Qualification.	Residence.
his William × Kirkwood mark	householder...	Burwood
James Hall	leaseholder ...	do
Tom Harvey	householder...	Glebeland
F. Christensen	do ...	Burwood
Enoch Evans	householder...	Burwood
James Butler	leaseholder ...	do
William Campbell	householder...	do
her Margaret × Screen mark	leaseholder ...	do
his Peter × Parsons mark	householder...	do
Robert Archibald	leaseholder ...	do
Isaac Screen	householder...	do
John Rees	leaseholder ...	Burwood
John Perry	do ...	Burwood
Thos. Irving	householder...	Glebeland
his Hugh × Sweeny mark	leaseholder ...	Burwood
Wm. Ellison	do ...	do
Thos. Campbell	householder...	do
John Stuart	householder...	Burwood
his Michael × Bolton mark	leaseholder ...	do
her Ann × Thomas mark	householder...	do
Thomas Watson	leaseholder ...	do
William Lacey	do ...	do
John Gullion	leaseholder ...	do
Alfred Hodwell	householder...	do
James Searl	do ...	do
Mark Johnson	do ...	do
his Alexander × Miller mark	do ...	do
Neil M'Crimmon	do ...	do
William Hammond	do ...	do
his Thomas × Wood mark	leaseholder ...	Glebeland
Frederick King	do ...	Burwood
George Bailey	do ...	Glebeland
James Mouter	leaseholder ...	Burwood
John Gray	do ...	do

We, Alexander Lindsay, mining engineer, of Burwood, Newcastle, and Robert Patterson, miner, of Glebeland, Newcastle, in the Colony of New South Wales, do solemnly and sincerely declare that all the signatures affixed to the above Petition are the genuine signatures of the persons whose signatures they purport to be, and that such persons are persons liable to assessment for municipal taxes in respect of property or household residence within the boundaries of the proposed Municipal District, as set forth in this Petition.

ALEXANDER LINDSAY.
ROBERT PATTERSON.

Declared and subscribed at Newcastle, this 29th day of December, 1884, before me,—

GEO. H. MILSON, J.P.

Minute for the Executive Council, 30/12/84. Herewith, 30/12/84.

Minute Paper for the Executive Council.

MEREWETHER—COUNTER PETITION AGAINST INCORPORATION.

Colonial Secretary's Office, Sydney, 30 December, 1884.

WITH reference to the Petition, of which the substance and prayer were published in a Supplementary Government Gazette, of the 24th September last, from 243 persons, who would upon incorporation be liable to be assessed for Municipal taxes, praying that a certain area in their Petition defined might be incorporated as a Municipality under the name of the "Municipal District of Merewether," I now recommend the publication in like manner of the accompanying counter Petition, signed by 251 persons, who would be similarly liable against the incorporation of the proposed Municipality.

WILLIAM B. DALLEY.

Minute of Executive Council.

THE Executive Council advise that the substance and prayer of the counter Petition, herewith submitted be published as herein recommended.

ALEX. C. BUDGE,
Clerk of the Council.

Approved.—A.L., 2/1/85. Min. 85-1, 2/1/85.—Confirmed, 6/1/85. Published in Supplementary Government Gazette, No. 60, of 13 February, 1885, *Newcastle Herald* and *Newcastle Despatch*, 18 February, 1885.

To His Excellency the Right Honorable Lord Augustus William Frederick Spencer Loftus, Governor and Commander-in-Chief of the Colony of New South Wales.

The humble Petition of the Burwood Coal-mining Company (Limited), who would in the event of the incorporation of the "Municipal District of Merewether" be liable to be assessed for Municipal taxes in respect of property within the boundaries of the proposed Municipality, as set forth in the substance of the Petition published in the Government Gazette, of the twenty-fourth day of September last, number 486, respectfully showeth, as follows:—

That if any Municipality be proclaimed, then no object can be attained by including a railway or tram-line used by your Petitioners from what is termed the Junction within the proposed boundaries to the Redhead Tunnel outside the proposed boundaries, as there are few (if any) residents on the side of the said railway line facing the Pacific Ocean.

Your Petitioners therefore humbly pray,—

That should your Excellency decide to proclaim a Municipality, that the boundaries may be limited so as not to include the said railway line.

G. OSWALD HYDE.
M. C. COWLISHAW.

Signed and sealed by two of the Directors of the Burwood Coal-mining Company (Limited), in the presence of,—

JNO. MESTON,
Manager.

Sydney, 31 December, 1884.

The

The Manager, Newcastle Coal Company, to The Principal Under Secretary.

The Newcastle Coal-mining Company (Limited).

Sir, Manager's Office, Scott-st., Newcastle, 30 December, 1884.

I have the honor to forward (enclosed) a Petition from the Newcastle Coal-mining Company (Limited) against the incorporation of the proposed Municipal District of Merewether, which, with the Petition from the inhabitants also against incorporation, it is to be hoped will have the desired effect.

STEWART KEIGHTLEY,
Manager.

[*Enclosure.*]

To His Excellency the Right Honorable Lord Augustus William Frederick Spencer Loftus, Knight Grand Cross of the Most Honorable Order of the Bath, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

The humble counter Petition of the undersigned respectfully showeth,—

1st. That your counter Petitioners learn a Petition was lately presented to your Excellency under the provisions of the Municipalities Act of 1867 from a number of persons praying for the incorporation, under the title of the District of Merewether, of certain lands therein defined.

2nd. That your counter Petitioners are informed, and do believe that, with the exception of 32 acres or thereabouts, the property of the Church of England, Newcastle, the whole of the lands proposed to be incorporated are the property of Edward Christopher Merewether.

3rd. That the terms of the letting of the said land and of the occupation of the tenants will prevent any buildings of value being erected thereon, and the vehicular traffic will consequently be very limited.

4th. That dwellings erected on the said area are widely scattered, and the nature of the country would require an enormous expenditure to be made to carry streets past even a majority of the houses now erected.

5th. That the said dwellings are nearly all of wood, of very simple construction and unsubstantial character, and generally speaking are mere huts.

6th. That certain coal-mines under the surface of the proposed Municipality are leased by the said Edward Christopher Merewether to the Newcastle Coal-mining Company (Limited), who have only a very small portion of surface land in their occupation, and the rates on the said mines and on the railway therefrom to the borders of the adjoining Municipality would constitute almost the whole of the revenue of the Municipality, while the Company paying it would derive no benefit from the incorporation.

7th. That if the said proposed Municipality were incorporated, the management of the affairs thereof, and the expenditure of the rates, would rest with a comparatively small number of individuals, whose rates would amount to only a few shillings a year each, while the Company, out of whose pockets at least nine-tenth of the rates would come, would have neither vote nor voice in the expenditure of the funds to which it would so largely contribute.

8th. That the population of the proposed Borough is chiefly a mining population, and the people of the poorer classes.

9th. That an admirably kept main road runs immediately past the centre of the population in the proposed Borough.

10th. That your Petitioners being lessees, would reap no benefit by the proposed incorporation, and would be taxed to enhance the value of the fee simple.

Your counter Petitioners therefore humbly pray that your Excellency will be pleased to refuse to declare the aforesaid Borough as incorporated under the said Act; and that your Excellency will be pleased to cause such inquiry to be made with respect to the allegations set out in the counter Petition herein contained as may to your Excellency seem necessary in that behalf.

And your counter Petitioners, as in duty bound, will ever pray, &c.

Signed on behalf of the Newcastle Coal-mining Company (Limited),—

FRED. ASH, } Directors.
W. A. STEEL, }
STEWART KEIGHTLEY, Manager.

Newcastle, 30th day of December, 1884.

I, James Lacey, of Glebe, near Newcastle, in the Colony of New South Wales, do solemnly declare that the seal affixed to the above Petition is the common seal of the Newcastle Coal-mining Company (Limited), a corporation, and that all the signatures affixed thereto are the genuine signatures of the persons whose signatures they purport to be, who are directors of the said corporation, and that the said corporation is liable to assessment for municipal taxes in respect of property or leasehold residence within the boundaries of the proposed Municipal District of Merewether.

Declared and subscribed at Newcastle, this thirtieth day of December, one thousand eight hundred and eighty-four, before me,— } JAMES LACEY.

THOMAS BROOKS, J.P.

Chief Clerk for report, 3/1/85. I do not think this can be treated as supplementary to the counter Petition, as the three months allowed have elapsed, and the reasons given are altogether different to those in the counter Petition. It is a second petition,—5/1/85. Inform, 5/1/85. Mr. Keightley, 6/1/85.

Mr. A. Lindsay to The Principal Under Secretary.

Sir, Patrick-street, Newcastle, 2 January, 1885.

Referring to the interview I had the honor of having with you on the 30th ultimo, respecting the Petitions for and against the proposed incorporation of the Municipal District of Merewether, I do myself the honor to state the following reasons why the supplementary Petition in favour of incorporation should not be received.

The

The 10th section of the Municipalities Act enacts that the Governor on receipt of the Petition for incorporation, which is to contain certain particulars, is to cause the substance and prayer of that Petition to be published, and that unless a counter Petition be received by the Minister within (3) three months from the date of publication, the Governor may proclaim the Municipality.

The subsequent sections speak only of the original Petition and counter Petition, and it is clear no others are contemplated.

The publication is the starting point. Those who object to the incorporation have to answer the published Petition, and to do so with a greater number of names than were attached to that Petition.

If a supplementary Petition were presented then that should be advertised, and a supplementary counter Petition could be sent in within the next three months, and then there would be no finalty if those in favour of incorporation were to be at liberty to do as they wish.

In fact, were the supplementary Petition published and acted on, then I contend it would override the original one and start matters afresh.

I may state that more signatures could easily have been obtained to the counter Petition had it been considered necessary to do so.

Should the supplementary Petition be forwarded to His Excellency, I respectfully claim that a supplementary counter Petition should also be received and forwarded.

In conclusion, I beg leave to say that within the whole of the land proposed to be incorporated there is not one single public road; it is the private property of C. E. Merewether, with the exception of 34 acres held by the Minister of the Church of England, Newcastle, and he has all along refused to dedicate 1 inch of ground for a street to the Newcastle Council portion of the said Borough on the south, being part of Burwood Estate.

I have, &c.,

ALEXANDER LINDSAY.

The majority of people residing about here are living on the Church land, having no where else to go, and the following is a true copy of their lease:—CHRIST CHURCH, Newcastle, 31 July, 1876. I hereby agree to let to David Salt, allotment No. 18 of section C, at the Glebe, and to give him a lease thereof, for the term of my incumbency; or in case of my handing over the same to Trustees, for a term of not less than twenty-one years, such lease to date from the 1st day of August, 1876. The rent is to be paid quarterly in advance, or the lease will be forfeited.—ARTHUR E. SELWYN.

P.S.—Although the holding by this is bad, as you will see for yourself, I consider it far before Merewether's. Copy of his I will send also, if you desire to see it.—A. LINDSAY.

Chief Clerk for report, 6/1/85. The objection to the receipt of the supplementary list of signatures to the Petition for incorporation cannot be entertained, but Mr. Lindsay should be informed that a supplementary counter Petition will be received.—7/1/85. This practice of admitting supplementary Petitions seems likely to lead to complications; and the keenness of the contest in this case of Merewether suggests that the time has come when this Department should be fortified with an authoritative, and clear interpretation of the law as applied to such cases. Another case (that of Kogarah) is now in hand. I suggest that the opinion of law officers be taken whether the publications of such supplementary Petition is the beginning of a fresh period of three months under section 10, and whether there is any limit to the admission of such Petitions.—8 Jan., 1885. The Crown Solicitor will perhaps kindly advise in this case.—C.W. B.C., 9/1/85.

The Principal Under Secretary to the Manager, Newcastle Coal-mining Company.

Sir,

Colonial Secretary's Office, Sydney, 6 January, 1885.

In acknowledging the receipt of your letter of the 30th ultimo, I am directed by the Colonial Secretary to inform you that the Petition therein submitted against the proposed incorporation of a Municipality to be called the "Municipal District of Merewether" cannot be treated as supplementary to the counter Petition already received, as the three months allowed by law have elapsed since the publication of the original Petition, and the reasons given are not the same as those given in the counter Petition.

I have, &c.,

CRITCHETT WALKER.

The Manager, Newcastle Coal Company, to The Principal Under Secretary.

The Newcastle Coal-mining Company (Limited),

Sir,

Manager's Office, Scott-st., Newcastle, 19 January, 1885.

I have the honor to acknowledge the receipt of your letter 85–29, dated 6th instant, with regard to this Company's Petition against the proposed incorporation of the "Municipal District of Merewether."

In reply thereto, it is not desired that our Petition shall be treated as supplementary to the counter Petition from the inhabitants of the district alluded to, but that it shall be treated as a Petition direct from this Company against the proposed incorporation, a course which I presume the Company is entitled to adopt, irrespective of any other party or any reasons that may be set forth by such party or parties.

With regard to dates, the Petition in favour of incorporation was not published in Newcastle until the last day of September. Our Petition having reached you on the last day of December, the three months allowed by law has evidently been observed. I have therefore to request that you will receive the Petition of this Company upon its merits, and when considering the application made, take it into account.

I have, &c.,

STEWART KEIGHTLEY, Manager.

Chief Clerk for report.—28/1/85. This Petition as a counter Petition under section 10 of the Act is informal; but it may be considered (as Mr. Keightley herein suggests) "upon its merits," when the Government comes to exercise its discretion upon the question of incorporation.—28/1/85. Yes.—28/1/85. Mr. Keightley, 30/1/85.

The Principal Under Secretary to The Manager, Newcastle Coal Company.

Sir, Colonial Secretary's Office, Sydney, 30 January, 1885.

In reply to your letter of the 19th instant, I am directed by the Colonial Secretary to inform you that the Petition from the Newcastle Coal-mining Company against the incorporation of the proposed Municipal District of Merewether is informal, as a counter Petition under section 10 of the "Municipalities Act of 1867," but that it will be considered, as suggested by you, "upon its merits" when the Government comes to exercise its discretion upon the question of incorporation.

I have, &c.,
CRITCHETT WALKER.

Mr. A. Lindsay to The Principal Under Secretary.

Sir, Patrick-street, Newcastle, 5 February, 1885.

I do myself the honor of drawing your attention to the fact that a Petition signed by thirty-one persons has been published in Saturday's issue of the *Newcastle Advocate*, bearing date 31st January, 1885, purporting to be a supplementary Petition to the one published in the abovenamed newspaper on the 30th September, 1884, for the incorporation of certain lands in this district, to be known as the Muuicipal District of Merewether.

In reply to the above, I beg leave to say that I am now at a loss to know how to act, or what course to pursue, to oppose the proposed incorporation, as the Act to me does not seem to provide a course of procedure for me to follow; in fact it seems to me the receiving of a supplementary Petition to be foreign to the spirit or intention of the Act. Clause 10, pages 6 and 7, provide definite instructions how to act in constituting new municipalities; but although I have carefully searched the Act through of 1867, I have entirely failed to find one word about receiving supplementary Petitions, or how to oppose them.

Would you, therefore, be kind enough to advise me at your earliest convenience, on behalf of self and counter Petitioners, what clause you are proceeding under, and what clause provides our remedy, and whether we have (3) three months allowed to oppose supplementary, same as original, because the Municipalities Act of 1867 that we have here does not enlighten us on those points, and by receiving the above information from you, we will then be able to decide what course is best to pursue so that wo may successfully oppose it.

Trusting to hear from you thereon at your earliest convenience.

I have, &c.,
ALEXANDER LINDSAY,
(For self and counter Petitioners.)

The Crown Solicitor to The Principal Under Secretary.

Sir, Crown Solicitor's Office, Sydney, 9 February, 1885.

I have the honor to return herewith the papers which were forwarded to me under B.C. 9/1/85, relating to the proposed incorporation of the Municipal District of Merewether and the admission of supplementary Petitions, and to state that I have submitted the matter to Mr. Attorney General Dalley, a copy of whose advising thereon will be found on the other side of this letter.

I have, &c.,
JOHN WILLIAMS,
Crown Solicitor.

[*Enclosure.*]

In *re* supplementing a Petition for incorporation of Merewether.

I am of opinion that no such course as that proposed to be adopted can be legally taken. The matter of granting or withholding the incorporation must be determined on the original application and on the counter Petition, if such be forwarded against the incorporation. To hold any other view would be to prevent any finality in dealing with the question.

WILLIAM BEDE DALLEY,
Attorney General.

Colonial Secretary's Office, 3 February, 1885.

Inform, in accordance with opinion of Attorney General.—C.W., 16/2/85. Mr. Alex. Lindsay, Ninian Melville.—21 Feb., 1885.

The Principal Under Secretary to Mr. Ninian Melville, M.P.

Sir, Colonial Secretary's Office, Sydney, 21 February, 1885.

With reference to the recently published supplementary list of persons in favour of the incorporation of the proposed Municipal District of Merewether, I am directed by the Colonial Secretary to enclose for your information a copy of an opinion that has been given by the Attorney General on the subject, from which it will be seen that the matter of granting or withholding the incorporation must be determined on the original application and on the counter Petition.

I have, &c.,
CRITCHETT WALKER.

The Principal Under Secretary to Mr. Alexander Lindsay.

Sir, Colonial Secretary's Office, Sydney, 21 February, 1885.

In reply to your letter of the 5th instant with reference to the recently published supplementary list of persons in favour of the incorporation of the proposed Municipal District of Merewether, I am directed by the Colonial Secretary to enclose for your information a copy of an opinion that has been given by the Attorney General on the subject, from which it will be seen that the matter of granting or withholding the incorporation must be determined on the original application and on the counter Petition

I have, &c.,
CRITCHETT WALKER.

Mr

Mr. John Young, and other Gentlemen, to The Colonial Secretary.

Sir, Burwood, Newcastle, 13 March, 1885.

We, the undersigned, on behalf of the persons who have already petitioned for the incorporation of the proposed Borough of Merewether, humbly ask that you might be pleased to cause an inquiry to be held concerning the late counter Petition forwarded against the incorporation of the said Borough. We beg to submit the following reasons for seeking such inquiry:—

1. It is alleged in the counter Petition that an admirably kept Government road runs through the proposed Municipality, which we can prove is not a fact.
2. On the counter Petition there are several names of persons who signed the original Petition, along with ourselves, in favour of incorporating the proposed Borough of Merewether.
3. There are also on the counter Petition the names of females who are not entitled to vote in Municipal matters, inasmuch as they are neither leaseholders or householders, their husbands being the owners of the lease or house, as the case may be.
4. In conclusion, we trust the above reasons will be deemed sufficient grounds for our request to be granted, and that it may please you to cause an inquiry to be held at an early date.

We have, &c.
JOHN YOUNG.
JOHN WILSON.
HENRY LOVELL.
CALEB JONES.
JOHN GRIFFITHS.
WILLIAM WILSON, Sec. to the Incorporation Committee.

As a scrutiny of signatures has been demanded, Mr. A. A. P. Tighe might be appointed to inquire into the Petitions under the 12th section of the Municipalities Act.—C.W., 18/3/85. Approved.—W.B.D.

The Principal Under Secretary to Mr. John Young, and the other Gentlemen who signed Petition for incorporation.

Gentlemen, Colonial Secretary's Office, Sydney, 19 March, 1885.

In acknowledging the receipt of your letter of the 13th instant, I am directed by the Colonial Secretary to inform you that it has been decided, in consequence of the representations therein made, to cause an inquiry to be held under the 12th section of the Municipalities Act of 1867 as to the validity of the signatures attached to the counter Petition against the incorporation of a Municipality to be called the "Municipal District of Merewether," as also generally concerning the Petitions, and that Mr. A. A. P. Tighe, J.P., of Petersham, has been appointed to hold the proposed inquiry.

I have, &c.,
CRITCHETT WALKER.

The Principal Under Secretary to Mr. Daniel Conway, and the other Gentlemen who signed the counter Petition.

Gentlemen, Colonial Secretary's Office, Sydney, 19 March, 1885.

Referring to your counter Petition against the incorporation of a Municipality to be called the "Municipal District of Merewether," I am directed by the Colonial Secretary to inform you that it has been decided, in consequence of certain representations which have been made on behalf of the Petitioners for incorporation, to cause an inquiry to be held under the 12th section of the Municipalities Act of 1867 as to the validity of the signatures attached to the counter Petition; as also generally concerning the Petitions, and that Mr. A. A. P. Tighe, J.P., Petersham, has been appointed to hold the proposed inquiry.

I have, &c.,
CRITCHETT WALKER.

The Principal Under Secretary to Mr. A. A. P. Tighe, J.P.

Sir, Colonial Secretary's Office, Sydney, 19 March, 1885.

It having been decided, in consequence of certain representations made on behalf of the Petitioners for the incorporation of a Municipality to be called the "Municipal District of Merewether," to cause an inquiry to be held under the 12th section of the Municipalities Act of 1867 as to the validity of signatures attached to a counter Petition against such incorporation (which was published as to its substance and prayer in a supplementary Government Gazette of the 13th of February last) as also generally concerning both Petitions, I am directed by the Colonial Secretary to inform you that he has appointed you to hold the proposed inquiry.

2. I am desired to invite your attention to the 13th and 14th sections of the Municipalities Act, whereof the former sets forth the manner in which the inquiry may be conducted, while the latter fixes the time within which the report shall be made.
3. All the papers connected with the matter are enclosed for your information.
4. Your services will be remunerated at the rate of two guineas and a half a day.

I have, &c.,
CRITCHETT WALKER.

Mr. A. Lindsay to The Principal Under Secretary.

Sir, Patrick-street, Newcastle, 28 March, 1885.

Three (3) months ago I presented a Petition against the incorporation of the proposed Municipality of Merewether, and not having heard from you that anything had been done by the other side, I presume it will be all at an end again, if this is so, kindly advise at your earliest convenience. The (3) three months will be up on Monday, the day you receive this from me.

I have, &c.,
ALEXANDER LINDSAY.

Mr. A. A. P. Tighe to The Principal Under Secretary.

Sir, Petersham, 14 April, 1885.

I have the honor to report that in accordance with the directions in your letter of the 19th ultimo, I held an inquiry as to the validity of signatures attached to a counter Petition against the incorporation of a Municipality, to be called the Municipal District of Merewether, and also generally concerning such Petition and a Petition for such incorporation. I herewith return all the papers which were enclosed in your letter.

The evidence taken at the inquiry is hereto appended. It discloses that a portion of the area of the proposed Municipality is the property of Mr. Merewether, and that the remaining portion is Glebeland, held as such by the Rev. Canon Selwyn, the Incumbent of Christ's Church, Newcastle, and that both proprietors have leased considerable portions of their respective lands in building allotments to a large number of persons. A copy of what is stated to be Mr. Merewether's conditions of lease is appended to the evidence (exhibit C). It appears that the Rev. Canon Selwyn does not consider that the nature of his holding permits him to dedicate for permanent streets any of the Glebeland which is now used as streets (exhibit A).

The evidence as to the condition of the main road referred to in the counter Petition is conflicting. A majority, however, of those who gave evidence on the point spoke favourably of the road. The same may be said of those who gave evidence as to the general condition of the roads and streets of the proposed Municipality. The evidence is also conflicting as to the condition and quality of the houses generally within the area referred to. The preponderance of evidence is in favour of the opinion that the houses are for the most part built with a view to serve for dwellings only during the continuance of the leases, but it appears that there are some good substantial weatherboard and other kinds of structures on both Mr. Merewether's and the Church land.

The counter Petition contains 251 signatures. One of the persons, whose names are attached to it, states that he did not sign or authorise anyone to sign for him; two were not qualified, they having sub-let the property in respect of which they signed, the tenants holding under them were the occupiers. and therefore the persons "liable to be assessed"; two signed who had no qualification; six married women signed as leaseholders, but in each case the husband was the person "liable to be assessed," he being the occupier; one married woman signed as a householder, but her husband was the occupier. So far then the counter Petition contains 12 invalid signatures, and 239 valid signatures.

The Petition contains 243 signatures. One person signed it twice, and two signed who had no qualification. So far the Petition contains 3 invalid signatures, and 240 valid signatures.

37 persons signed both the Petition and the counter Petition, 29 of whom desire their names to be retained to the counter Petition and erased from the Petition, while the other 8 persons desire the reverse. Neither the Municipalities Act of 1867 nor the Amendment Act of 1874 directs or indicates how such signatures should be dealt with. It must be intended that they should be dealt with in some way, otherwise in cases like the present, where there is no dispute as to the genuineness of the signatures or the qualification of the persons who wrote them, the 2nd section of the Amendment Act of 1874 would be void of any purpose or effect.

Only three possible modes of dealing with such signatures occur to me.

1st. That they might be dealt with in accordance with the expressed wish of the persons who signed.

2nd. That the signatures to the counter Petition (being the later ones) might be considered to supersede the same signatures to the Petition, and consequently be held to be cancelled as respects the Petition, and to have effect only in respect of the counter Petition.

3rd. That the persons who signed the Petition were not competent to sign also the counter Petition. The Municipalities Act may not intend to permit the same person to sign both for and against the proposed incorporation. The true interpretation and meaning of the words of part of the 10th section of the Act of 1867 may be—"And unless a counter Petition signed by a greater number of (*other*) persons in like manner liable to be assessed," &c.

I think I would transgress the bounds of the duty committed to me if I were to attempt or offer to decide what seems a doubtful point. I may, however, point out that if the first mentioned mode be adopted the counter Petition will have valid signatures, 231; and the Petition will have valid signatures, 211. If the second mode be adopted, the counter Petition will have valid signatures, 239; and the Petition will have valid signatures, 203. If the third mode be adopted, the counter Petition will have valid signatures, 202; and the Petition will have valid signatures, 240.

One of the persons who verified the signatures and signed the declaration to the counter Petition (Mr. Lindsay) appears not to have been qualified to do so, he not being "a householder resident within the proposed Municipality," but the other (Mr. Patterson) was then duly qualified, and his declaration will, no doubt, be considered sufficient.

I have, &c.,
A. A. P. TIGHE.

15

Proceedings of Inquiry.

PROCEEDINGS of an Inquiry under the Municipalities Act of 1867, held by the undersigned, as to the validity of signatures attached to a counter Petition against the incorporation of a Municipality to be called the Municipal District of Merewether, and also generally concerning such Petition and a Petition for such incorporation.

A. A. P. TIGHE.

Glebeland, 7 April, 1885.

MR GORRICK appears as Solicitor for the counter Petitioners, and Mr. Melville appears as agent for the Petitioners.

Examined by Mr. Melville.—Alexander Lindsay states: The declaration to the counter petition was made by me; the signature is mine: I then lived in Patrick-street, in the city of Newcastle; I admit that I was not at the time a householder within the proposed Borough of Merewether; I signed the counter petition as a leaseholder; I cannot produce my lease because it is only a verbal one; I saw all the signatures placed by the parties to the counter petition; I saw Thomas Phillips make his mark thereto; the road referred to in the counter petition runs through the proposed Municipality about ¾ of a mile; I never saw a 'bus stuck up on it; the Government formed and metalled the portion of the road I refer to; Mary Bland signed the counter petition; I saw her do so; I told her she had a right to sign it as well as the original petition if she thought fit; John Rees signed the counter petition, his qualification is within the proposed Municipality; I think there is only one brick building within the area; I decline to state the cost of any buildings on Mrs. Lindsay's property; some of the persons who signed the counter petition did the work of building with their own hands; the counter petition states that the new leases on Mr. Merewether's land contain prohibitory clauses; we mean by that that the lease is drawn with terms and conditions that no tenant can fulfil; one point is, that should any difference arise there shall not be any arbitration, that makes Mr. Merewether's decision final; tenants must build within a certain time and keep the buildings insured in Mr. Merewether's name; he rose the rent from £6 to £16 per acre; he can direct the course of the water where he pleases, and is not obliged to pay towards the cost of repairs or damage; he can compel any alterations and improvements that he thinks fit, and if not done by the tenants within three months the lease is liable to forfeiture; the statement in the counter petition about people signing the original petition in consequence of misrepresentation is quite true; I do not know that Mr. Merewether ever took advantage of the clause in the leases which gives him the power to direct the water into any allotment leased; I read to some of the persons who signed the counter petition the letter from the Rev. Mr. Selwyn, which I now produce (*Exhibit* A); as far as my memory serves me, Mr. Patterson was present as well as myself when the respective parties signed the counter petition; when I speak of the conditions in the leases, I quote from memory.

Examined by Mr. Gorrick—I saw Robert Patterson sign and make the declaration to the counter petition; Mr. Merewether holds about 1,118 acres of the area of the proposed Municipality; he declines to sell any; I have repeatedly asked him; he said he would not sell any; the remainder of the area is Glebeland, and no one has power to sell any of it.

ALEXANDER LINDSAY.

By Mr. Melville—John Fisher states: The signature John Fisher, householder, Glebeland, is not mine in the counter petition.

JOHN FISHER.

By Mr. Melville—Richard Gill states: I cannot write; I signed my mark to both petitions; I wish to cancel the signature against incorporation, and to hold to that in favour of it; I want incorporation to be established.

his

RICHARD × GILL.

mark.

By Mr. Melville—John Gulliver states: I signed both petitions; I am against incorporation; I had no leasehold qualification when I signed the counter petition; my lease had expired; I was then and am still an occupier of the land I had leased.

By Mr. Lindsay, for *Mr. Gorrick*.—My qualification is that of an occupier now.

JOHN GULLIVER.

By Mr. Melville.—Willoughby H. Sutton states: I signed both petitions; I am in favour of non-incorporation.

By Mr. Lindsay: I wish my name to be taken off the original petition.

W. H. SUTTON.

By Mr. Melville.—Margaret Lindsay states: I signed the counter petition: I hold a lease under the Married Women's Property Act, and therefore signed the counter petition; the property leased by me is within the area of the proposed Municipality; I leased part of the property to my husband; the rent is 10s. per year; the lease from me to my husband is a verbal one; I do not reside on the property; I receive the rent yearly; the area of the property leased to me is ¼ of an acre; I have leased a quarter of that to my husband.

MARGARET LINDSAY.

By Mr. Melville.—Mary Bland states: I signed both petitions; Mr. Lindsay and Mr. Patterson told me that the streets would never be made, and that the idea of incorporation was abandoned; they thus induced me to sign the counter petition; I afterwards asked them to strike my name off the counter petition, but they refused; I now wish my name to be taken off it; I am in favour of incorporation.

By Mr. Lindsay.—Both Mr. Lindsay and Mr. Patterson told me that the streets would never be made; I asked them to take my name away from the counter petition; I do not remember telling any one that I was afraid of getting into trouble through having signed both petitions.

MARY BLAND.

By Mr. Melville.—Jane W. Searle states: I signed the counter petition, so did my husband—I as a leaseholder, and my husband as householder of Glebeland; the lease is in my favour; the one property is referred to in both instances; we both reside on the property.

By Mr. Lindsay.—I am against incorporation.

J. W. SEARLE.

By

By Mr. Melville.—Constable Porter states: I did not serve the summons upon Ellen Sangster; she has left the district; I know her; she left about three months ago; she had then a husband; she told me he was engaged on the new railway, he appeared about that time in answer to a summons, and I served that summons at Ellen Sangster's house; I left it with her; it was for not sending their children to school; there is no other person of the same name in this locality.

By Mr. Lindsay.—They were reputed to be man and wife.

EDWIN PORTER,
Constable.

By Mr. Melville.—Margaret Screen states: I signed the counter petition; I signed it as a leaseholder; I hold the lease in my own name; the land belongs to Mr. Merewether; I made the mark to the signature myself; both Mr. Lindsay and Mr. Patterson were present; I took the lease before I married Mr. Screen; my husband also signed the counter petition; we both live on the property; my husband is the occupier; neither I nor my husband hold any other property which is situated within the area of the proposed Municipality; I pay the rent myself; my husband does not pay any rent for the property; I do not carry on any business apart from my husband.

her
MARGARET × SCREEN.
mark

By Mr. Melville.—Thomas Phillips states: I did not sign the counter petition; my name that I now look at to that petition was not written by me; it is a forgery; there is no other person of the same name who is a leaseholder of Burwood; I did not authorize any one to sign my name.

By Mr. Lindsay.—I saw you with the counter petition; you asked me to sign, and I refused; that was about twelve months ago; it might have been thirteen months; I never saw you before or since about the petition one way or another; I never put a mark to the counter petition; it might have been less than twelve months since I refused to sign the petition.

By Mr. Melville.—Mr. Lindsay never told me that he had put my mark to the counter petition for me.

THOMAS PHILLIPS.

By Mr. Melville.—Robert Walton states:—I signed the counter petition; Mr. Lindsay and Mr. Patterson were present; I also signed the petition in favour of incorporation; I wish my name to be taken off the counter petition, and to be retained on the original petition in favour of incorporation.

ROBERT WALTON.

By Mr. Melville.—Elizabeth Gibson states: I signed the counter petition; I am a leaseholder from Canon Selwyn; my husband has also signed as William Gibson, householder, Glebeland; we live together on the property; I do not carry on any business on my own account; my husband has no other qualification as liable to assessment except as the occupier of the land I lease; the land is within the proposed Municipality.

By Mr. Lindsay.—The property was leased by my former husband, and left by him to me; he exercises no control over the property except occupying it with me; I here refer to my present husband.

By Mr. Melville.—I decline to say whether I have any means of support apart from my husband.

ELIZABETH GIBSON.

By Mr. Melville.—Mary Wilmott states: I signed the counter petition; so did my husband, at least he made his mark to it; I signed as a leaseholder; I lease from Canon Selwyn; my husband holds no other property; we both live together on the land; my husband signed as householder; we both signed in respect of the same property; it is within the area of the proposed Municipality.

By Mr. Lindsay.—I hold the land independently of my husband; I have held it eight years; my husband has no control over it.

MARY WILMOTT.

By Mr. Melville.—Eliza Stallard states: I signed the counter petition as a leaseholder; I hold the lease in my own name from Canon Selwn; I hold the land independently of my husband; we both live on the land; it is our dwelling-place; my husband is the occupier and I am the leaseholder of it.

By Mr. Lindsay.—My husband has no control over the property; I built a second house on the same leased land; I let that house to a tenant; it was so let when I signed the counter petition.

E. STALLARD.

By Mr. Melville.—Henrietta Doohan states: I signed the counter petition as a leaseholder; the land leased is situated in the proposed Municipality; my husband and I dwell on the leased land; he occupies the dwelling thereon with me; he has nothing to do with the property only as an occupier, not as a leaseholder of it.

By Mr. Lindsay.—It is my own *bona fide* property; I alone have to look after anything required for it; I assist to support the family by doing work.

H. DOOHAN.

By Mr. Melville.—Louis Crawley states: I signed the counter petition as a householder; I see my father's signature to the same counter petition; that is his handwriting; he is a leaseholder of the same property that I claim to be the householder; he is very ill, and quite unfit to appear here; he is about 80 years old; I took the lease out in his name, but I pay the rent and keep my father; he lives with me; I am the occupier of the property and the master of the house on it.

LOUIS CRAWLEY.

By Mr. Melville.—Margaret Conway states: Mr. Lindsay called on me with the counter petition; I signed it; I hold a lease for land within the proposed Municipality; there were tenants holding under me on the same land when I signed the counter petition; I built houses on the land and let them to tenants; neither I nor my husband occupy the land or any part of it; it is sub-let; I have had the land about twenty years.

By

By Mr. Lindsay.—I signed against incorporation; all the land was sub-let by me when I signed the counter petition; my husband has no control over the property.

her
MARGARET × CONWAY.
mark

Adjourned until to-morrow at 10 o'clock a.m.

A. A. P. TIGHE.

Glebeland, 8 April, 1885.

By Mr. Melville.—John Rabbas states: I signed the counter petition, and also the petition for incorporation; I wish my name to be taken off the counter petition; I am in favour of incorporation; I am a householder within the proposed Municipality.

JOHN RABBAS.

By Mr. Melville.—John Rees states: I know no other person of the same name as myself in this neighbourhood; the signature John Rees to the counter petition is not my signature.

By Mr. Gorrick.—I know John Rees at Newcastle; another man of the same name may have signed the counter petition.

JOHN REES.

Mr. Melville.—Constable Porter states: I knew a man living at Glebeland named Daniel Phillips; he was a boarder in the house of Edmund Phillips; he has left the district; he left in December last; I know no other person named Daniel Phillips here; he was not a householder, he was only a boarder; I have lived here nearly five years; I knew one John Gardner here, he was a lodger here; I never knew him to be a householder; he left the district some time ago; I cannot say how long; I know of no other John Gardner in this district.

By Mr. Gorrick.—Daniel Phillips was in this neighbourhood in December last; I do not think John Gardner was, he might have been; I cannot say they were not householders, they may have been so for a week while the petition was going round.

By Mr. Melville.—I never knew them as householders; I knew them both well.

EDWIN PORTER, Constable.

By Mr. Melville.—Constable Porter states: I served a summons on Minnie Smatell to appear at this inquiry; she is not in attendance; she told me that she would not appear when I served the summons; I also served a summons on Caroline Smatell; I left it with the landlady where she boards; Caroline Smatell is not in attendance; I know them both; I believe they are single girls; at the time the counter petition was being signed they both lodged here with one David Thomas.

By Mr. Gorrick.—I could not say that they were not householders when they signed the counter petition.

EDWIN PORTER, Constable.

By Mr. Melville.—David Thomas states: I have lived here for six or seven years; Minnie and Caroline Smatell were lodgers of mine for six or eight months; they left my house about ten weeks ago; the both told me that they had signed the counter petition against incorporation; they did so while they lodged with me.

By Mr. Gorrick.—I let a house to one M'Intyre; the young women paid him rent for one fortnight for a room; they did not sign the counter petition during that fortnight; they lived at my house in December last; I let them have a room in return for work they did for me; instead of paying rent they did work.

By Mr. Melville.—They paid part of their lodging-money by service; the house was occupied by myself, M'Intyre, and the two young ladies in December last; each of us had a separate portion of the house.

DAVID THOMAS.

By Mr. Melville.—William Burchill states: I signed the counter petition, also the petition for incorporation; I am in favour of incorportion, and I want my name to be struck off the counter petition.

WILLIAM BURCHILL.

By Mr. Melville.—Henry Burns states: I signed the petition for incorporation, and counter petition also; I wish my name to remain on the petition for incorporation, and to be struck out of the counter petition; I know Louis Crawley who gave evidence here yesterday; I know John Crawley; I did not see them sign any petition; they live on the same allotment with me, but in another house; they both occupied that house in December last in common with Crawley's father; John Crawley is married, and had his family in the house; the lease is in the name of Louis Crawley, senior; John Crawley is the master of the house, and Louis Crawley, junior, pays John Crawley for board; the elder Louis Crawley is kept by the family; he is very old and infirm; we all are related to each other, and live on the same allotment; I see John Crawley's name to the counter petition; that is his signature.

By Mr. Gorrick.—I occupied a house and paid rent for it to John Crawley when I signed the counter petition; one Sheldon occupied a third house on the same allotment in December last.

HENRY BURNS.

By Mr. Melville.—John Finlayson states: I signed the counter petition, and also the petition for incorporation; I wish to withdraw my name from the counter petition, and to let it remain on the original petition; I am in favour of the proposed incorporation; I and two other men occupied a house here when I signed the petitions; we paid the rent between us; we all three were liable for the rent.

By Mr. Gorrick.—I have no lease; I assist to pay the rent; Thomas Smith leases from Mr. Merewether, and we three tenants pay the rent to Smith.

JOHN FINLAYSON.

By Mr. Gorrick—David Wilson states: I signed both the petition and the counter petition; I wish my name to be withdrawn from the petition, and to be left on the counter petition; I am not in favour of incorporation; I did not understand the thing properly when I signed; I was induced to sign because it was represented to me that the place would be added on to the Newcastle Borough unless we had a separate Borough; on that representation I was led to sign in favour of incorporation.

By Mr. Melville—My mind was made up to sign against incorporation before Mr. Lindsay asked me to sign the counter petition; I do not know what road is referred to in it; there is not a proper made road to my house from the main road; I think Mr. Lindsay read the counter petition to me when I signed it; I lease the property that qualifies me to sign; the roads all about here are very bad.

DAVID WILSON.

By Mr. Gorrick.—John Watkins states: I signed the petition for incorporation and also the counter petition; I want the signature to remain to the counter petition, and to be struck off the petition in favour of incorporation.

By Mr. Melville.—I do not remember what Mr. Lindsay said to me when I signed the counter petition; the roads about here are in a bad state; the main road is about 250 yards from my residence; I do not know the road referred to in the counter petition; the road used by the 'busses is a good one.

JNO. WATKINS.

By Mr. Lindsay.—Peter Penman states: I signed the counter petition as a householder of Glebeland; I was then only two days in the place; when I signed Mr. Lindsay told me that the counter petition was against incorporation; I was a householder when I signed.

PETER PENMAN.

By Mr. Melville.—Robert Archibald states: I signed the counter petition and also the petition for incorporation; I am in favour of incorporation; I want my name struck off the counter petition, and kept on the petition in favour of it; I expect we will get good roads made here if we are incorporated; in bad weather the roads are very bad; they are very bad on the Church land; we have no roads metalled.

By Mr. Lindsay.—I altered my opinion because I thought incorportion would be better for us all; I learned that the taxes would not be so heavy as I at first thought; I did not alter my opinion because I found that Mr. Lindsay had told me what was not true.

ROBT. ARCHIBALD.

By Mr. Melville.—Constable Porter states: I served a summons on Ann Thomas to attend here to-day; she is not in attendance; she lodges at a house kept by Mrs. Barnes (at least so Mrs. Barnes told me); I knew nothing about Ann Thomas's position at the time she signed the counter petition.

EDWIN PORTER (Constable.)

By Mr. Melville.—Henry Lovell states: I know Ann Thomas referred to by the last witness; she is a widow and lives with a relation of hers named Barnes; she lived there during and before December last; she is not and never was a householder here since the Municipality was proposed.

By Mr. Lindsay.—She never told me that she was only a boarder; she occupies a room in Barnes's place.

HENRY LOVELL.

By Mr. Melville.—Constable Porter states: I served John Crawley with a summons to appear here to-day; he is not present; I called him in the usual way this morning and this afternoon; he is a brother of Louis Crawley, who gave evidence yesterday afternoon, and brother-in-law of Henry Burns who gave evidence this morning; he lives in the same house as Louis Crawley; I saw him here yesterday; I believe he then came in answer to the summons (the summons was for yesterday) and to continue present during the inquiry until called upon to give evidence.

EDWIN PORTER (Constable.)

By Mr. Lindsay.—John Barnes states: I am a householder at Burwood, and also a leaseholder; Ann Thomas lives with me; she rents the two front rooms in my house; she pays me 4s. per week; she has done so for nine or ten months past; I do not find her in anything; she is not a boarder of mine, and never was.

By Mr. Melville.—I and my family occupy the back part of the house and Mrs. Thomas occupies the front; we each enter and leave by a different door; she is too ill to move about; she is not able to attend here; my residence and Mrs. Thomas's are two distinct holdings.

his
JOHN × BARNES.
mark

By Mr. Lindsay.—David Hutchinson states: I signed the petition for and the counter petition against incorporation; I want my name to be struck off the one in favour of incorporation, and to be retained against incorporation; I am opposed to the place being incorporated.

By Mr. Melville.—I live at Glebeland; the roads are good enough for me; I decline to answer any question as to the state of the roads; I once kept the "Travellers' Rest Hotel"; the road is a good one about that part of the proposed Municipality.

DAVID HUTCHINSON.

By Mr. Lindsay.—William Rendall states: I signed both the petition and the counter petition; I am in favour of non-incorporation, and want my name taken away from the petition in favour of incorporation and left on the counter petition.

By Mr. Melville.—The road leading to my place is blocked up by a building, and that is why I do not want incorporation; some of the roads are middling, others are very bad, especially in wet weather; a portion of the main road referred to in the counter Petition is metalled.

WM. RENDAL.

By Mr. Lindsay.—William Lacey states: I signed the petition and also the counter petition; I want my name to be kept on the counter petition and to be taken off the petition; I am against incorporation.

By Mr. Melville.—Morgan-street is not in the best condition; a few loads of stone would improve it; it is pretty well drained by a creek hard by; there are no good roads about here.

WILLIAM LACEY.

By Mr. Lindsay.—Thomas Campbell states: I signed both the petition and the counter petition I am against incorporation, and want my name struck off the petition and kept on the counter petition; the roads about here are good enough for me; I refer to the road mentioned in the counter petition, and say that I consider it a good road; the roads all about here are passable in fine weather, but bad in wet weather.

By

By Mr. Melville.—Part of the road referred to in the counter petition is metalled—not all of it; the road between my place and that road is not bad in some parts; I can cross it in any weather; some of the roads are not safe to travel on by night; they would not be dangerous if there were lamps; I never had an accident on the road; even if there were lamps a stranger could not safely travel by night; Patrick-street in Newcastle is as bad as any street within the proposed Municipality, and Newcastle is incorporated.

THOMAS CAMPBELL.

By Mr. Lindsay.—Joseph Littlefair states: I signed both the petition for and the counter petition against incorporation; I am against incorporation; I want my name to be taken away from the petition and kept to the counter petition; there is a good road where I live; the reason I signed the petition in favour of incorporation was because a party made me believe that unless we had our own incorporation we would be compelled to be tacked on to the Newcastle or Hamilton Corporation; only for that I would never have signed in favour of incorporation; it was one of the persons getting signatures to the petition who persuaded me so.

JOSEPH LITTLEFAIR.

By Mr. Lindsay.—George Bailey states: I signed both the petition and the counter petition; I am against incorporation; I wish my name to be struck out of the petition and retained to the counter petition.

By Mr. Melville.—The road is pretty fair near my property; there is no reason to complain of the roads generally; I do not know how they are in bad weather; I am not long in the district, and have had no very bad weather during my time; I broke my leg on one of the Glebe roads; there is a creek in the road, and the bank on the side gave way with me and I fell into it; there are no dangerous ruts in the road now; buggies can travel over the road very well, except where the creek crosses it several times; the roads generally are safe for foot passengers; they would be greatly improved by lamps; my house is worth about 7s. per week; I saw the road in which I broke my leg six weeks ago; it was then improved as compared with its state when I broke my leg. People do not improve the road by cutting drains; I have cut drains from my place into the creek; when I signed the petition for incorporation, I thought the lands about here would be given to the Corporation; when I say lands, I mean streets; and I now believe that the streets must be dedicated by the owners of the soil before the Corporation could deal with them; I would favour incorporation if the Corporation could, in my opinion, claim the streets on the property of the Church and Mr. Merewether.

By Mr. Lindsay.—We cut drains from the wash-house to the creek in the road; there is one creek, and there are also artificial drains in the streets; I broke my leg through an accident; I misjudged the quality of the ground I stepped across; I signed the petition for incorporation because I then thought the place wanted improving; when I saw the letter from Canon Selwyn, that he could not dedicate streets on the church land, I changed my opinion.

GEORGE BAILEY.

Adjourned until to-morrow at 10 o'clock a.m.

Glebeland, 9 April, 1885.

By Mr. Lindsay.—James Hookway states: I signed the petition in favour of incorporation; the signature thereto that I now look at is mine; it is witnessed and declared to by Mr. Curtin and Mr. Griffiths; I look at another signature to the same petition, which is also mine; as a matter of fact I signed the same petition twice; I first signed in my own house; it was left in my house for me to sign; Mr. Curtin's little girl was waiting for me to sign it; Curtin and Griffiths did not see me sign so far as I know; they were not in my house at the time—that I know.

By Mr. Melville.—The declaration to the petition of Curtin and Griffiths is true, so far as my first signature is concerned; I signed the second time because I had forgotten that I previously signed; Mr. Price has declared the truth in respect of my second signature, if he has made the declaration which I look at—having his name thereto.

JAMES HOOKWAY.

By Mr. Lindsay.—Kate Isabel Read states: I look at my name signed to the original petition; I put my mark to it; I do not nor did I then hold any qualification; I was not then an owner, lessee, or occupier of any property within the proposed Municipality; I did not understand the law of the matter at the time; I do not think the list of names was pasted on the sheet of large paper as it is now pasted.

By Mr. Melville.—I am a housekeeper in Mr. Blacknell's house at the Glebe; he is not a boarder of mine; I took the house from the landlord; Mr. Finan is the owner; sometimes I give the rent and sometimes Mr. Blacknell gives it; I did not tell the man that asked me to sign the petition that I was only a housekeeper.

her

KATE I. × READ.

mark

By Mr. Lindsay.—Mary Ann Barnes states: I am the wife of John Barnes, and I live with him in Burwood; we rent the two front rooms to Mrs. Thomas; Constable Porter served her with a summons last week to attend here; he served the summons by leaving it with me for her, and I immediately gave it to her; he was on horseback outside the gate in the road; I only said to him that Mrs. Thomas could not attend through illness; I did not say that Mrs. Thomas is only a boarder; she is not a boarder; she pays rent for her two rooms; if the constable says I told him she was a boarder, it is a barefaced untruth of his; Mrs. Thomas was sitting inside her house when I took the summons; I produce the rent-book showing the weekly rent paid by Mrs. Thomas for her two rooms; she has paid her rent up to the 30th of March last; we each have separate and distinct means of access to our respective dwelling-places.

By Mr. Melville.—The constable simply asked me if Ann Thomas lived with me; I said that she lived in the two front rooms; he said he had a summons for her, and I told him I would take it to her; I was not summoned to give evidence here; some lad came and asked me to come here and answer to my husband's name; I do not know what was the object of my coming here; I did not know that the constable had said that I told him Mrs. Thomas was only a boarder; the road is very good from my place

to

to here; I decline to answer any more questions; I will not say whether I ever saw any drays stuck up through the badness of the roads; there is a good road from my house to the railway line; anyone can walk very well from there to the main road; I have seen a dray stuck up by the badness of the road, but it was a considerable distance from my place.

M. A. BARNES.

By Mr. Lindsay.—Joseph Bowtell, junior, states: I signed both the petition and the counter petition; I wish my name to remain on the counter petition, and to be taken off the petition; I am against incorporation.

By Mr. Melville.—The counter petition was read to me before I signed it; we have a very passable road from our place to the main road; my father had repairs done to it; the other roads within the proposed Municipality are not so very bad; I have not known any drays stuck up for about two years; people improve the roads near their places by putting rubbish in the holes; the whole of the road referred to in the counter petition may or may not be metalled for all I know; there are about 300 yards of that road which are not metalled; the 'busses are able to travel over it right up to the "Traveller's Rest Hotel;" the petition I now look at has my father's signature to it; it is a petition referring to road improvements (*Exhibit* B); the main road could be improved by stuff taken from the top of the hill close by; a cart was capsized last winter at Burwood, partly through the bad road and partly through careless driving; the house I live in is put up just so as to last while the lease lasts; that is about another ten or twelve years; the bricks are laid in mud and only half bricks are used; the houses at Burwood are made of slabs, bark, and mud bricks made by the miners themselves; it would be hard to tell whether the majority of the houses consist of weather-boards; some are made of wattle and dab; there are not many empty houses about here; I changed my mind as to incorporation because Mr. Merewether need not dedicate any of the streets unless he pleases; another reason is because Canon Selwyn cannot allow any streets to be made on the Glebeland; the so-called streets on the Glebe are not public property; I signed the original petition because I then thought that Canon Selwyn could give streets; in very bad weather the roads and streets here are not safe in some places.

JOSEPH BOWTELL, Junr.

By Mr. Lindsay.—James Mouter states: I signed both the petition and the counter petition; I wish my name to remain on the counter petition, and to be taken off the petition; I do not want any incorporation for this place.

By Mr. Melville.—The roads about Burwood are very good, and are safe to travel over by night; so far as I know, all the roads within the proposed Municipality are good; my house is a weatherboard one, built on brick pillars; it is a good house; I consider the houses in my neighbourhood pretty good.

By Mr. Lindsay.—Some of the houses near me are poor ones.

JAMES MOUTER.

By Mr. Lindsay.—William Young states: I signed the petition and also the counter petition; I want my name taken off the petition and kept on the counter petition; I am opposed to incorporation; Curtin went round for signatures to the original petition, and told me that if I did not sign it, we would be forced to join the Newcastle corporation, and I was in that way induced to sign in favour of incorporation.

By Mr. Melville.—I would prefer to pay for good roads rather than be joined to Newcastle and get nothing from that corporation in return for taxes but lamps. The roads about here are pretty good; I do not have to carry a lamp when I go out of a night; my wife takes a lamp, but she is lame.

WILLIAM YOUNG.

By Mr. Lindsay.—Hugh Donnison states: I signed the petition and counter petition; I wish my name to remain on the counter petition and be taken off the petition; I am against incorporation; Mr. Griffith and Mr. Lovell were present when I signed the petition for incorporation; they both told me that the streets on the Church land could be dedicated, and that it was a hoax to say to the contrary; I would not have signed only for that.

By Mr. Melville.—There is a bridge in the street about 120 yards from my place; the neighbours, including myself, paid for it; the roads are very good near my place, and that is about the worst part of the proposed Municipality for roads; the bridge near my place is for horses and carts as well as for foot-passengers; the water-course in the street near Winterbine's butcher's shop is about a foot or two deep; if the bridge near my place were washed away vehicles could not pass in the street there.

HUGH DONNISON.

By Mr. Lindsay.—John Ballenden states: I signed the petition and the counter petition; I want my name to be kept on the counter petition and taken off the petition; I am against incorporation; I signed the petition because I was told we would thereby be able to have good roads, and that if we had not a corporation of our own, we would be taken into the Newcastle Corporation against our wish; I subsequently signed the counter petition, because Mr. Lindsay let me see the Municipalities Act, and I could then see that we need not join Newcastle against our will.

By Mr. Melville.—I live at Burwood; the streets are in good condition; the road is a bad one in wet weather near Sage's blacksmith's shop, but I consider it is safe to travel over by night; the main road referred to in the counter petition is not metalled all the way so far as I know, but I have never been along the whole of it; so far as I know it is well kept; some of the houses about here are substantial ones; some are not; most of them are substantial; I mean they look well on the outside, but they are put up very temporarily; most of the men who put them up did not very well understand how to do the work; my house is pretty fair; the frame-work of most of the houses is very slight; the house next to mine is about equal to mine; my house had to be passed by the architect of the Building Society.

JOHN BALLENDEN.

By Mr. Lindsay.—Alexander Goodwin states: I signed the petition for and the counter petition against incorporation; I want my name to be taken off the petition and to be kept on the counter petition; I am against incorporation; I signed the petition because I was led to believe that we would be compelled to join Newcastle corporation if we had not a corporation of our own; when I was convinced to the contrary, I signed the counter petition.

By

By Mr. Melville.—Nothing was said to me about a Local Government Act; the roads are good about my place; there is a water-course in one street, and the people near put bridges across it; I have to cross a railway to get to the main road from my house; my house is pretty fairly substantial; the work was passed by an architect; some of the houses are very bad; some of them are scarcely fit to live in; I cannot say whether the majority of them are good or bad; the main road referred to in the counter petition is good so far as I have been over it; I do not know that there are any funds available for keeping it in repair; I know no persons in the proposed Municipality who have not a fixed tenure; I cannot say whether the whole of the counter petition was read to me or not before I signed it; I did not notice the clause referring to fixity of tenure.

By Mr. Lindsay.—I am still of the same mind, that is, against incorporation; I understand that all the people who lease the Glebeland have no fixity of tenure; I have seen two of the so-called leases, and am satisfied that the Glebeland lessees have no fixed tenure; they are only good while Canon Selwyn lives.

ALEXANDER GOODWIN.

By Mr. Lindsay.—Peter Fisher states: I signed the counter petition as a householder; I held the qualification for about twelve months when I signed; I know Mrs. Helm; she is my housekeeper; I saw her put her mark to the name on the petition for incorporation; it is signed Mrs. Helm, her mark; she has no qualification as a householder now; she had none when she signed; she is now very ill, and not able to appear here; she has neither a leasehold, or household, or other qualification.

Mr. Melville and Mr. Lindsay agree to the withdrawal of Peter Fisher's evidence.—A.A.P.T.

By Mr. Melbille.—I was not present when Mr. Lovell called at my house with the petition; Mr. Watson brought the petition; I saw Mrs. Helm sign; I saw her sign her mark to it; if the petition I now look at is not the one Mr. Watson brought to my place, then I did not see Mrs. Helm put that mark, but I certainly did see her put her mark to a petition in favour of incorporation.

his
PETER + FISHER.
mark.

By Mr. Lindsay.—Robert Coulson states: I signed the petition and the counter petition; I want my name to be retained on the counter petition, and to be taken off the petition; I am opposed to any incorporation here.

By Mr. Melville.—I did not apply to any one for payment for coming here. I was summoned; I do not receive any payment.

ROBERT COULSON.

By Mr. Lindsay.—John Gray states: I signed the petition and the counter petition; I want my name to be kept on the counter petition and taken off the petition; I do not want any incorporation.

By Mr. Melville.—I was summoned to appear here.

JOHN GRAY.

By Mr. Lindsay.—Stephen Powell states: I signed the petition and the counter petition; I want my name to be kept on the counter petition, and taken off the petition; I do not want the place to be incorporated.

By Mr. Melville.—I changed my wish about incorporation after I read Canon Selwyn's letter.

STEPHEN POWELL.

By Mr. Lindsay.—Thomas Graham states: I signed the petition and the counter petition; I want my name to be kept on the counter petition and taken off the petition; I do not want any incorporation.

THOS. GRAHAM.

By Mr. Lindsay.—George Kirkwood states: I signed the petition and the counter petition; I want my name kept to the counter petition and taken off the petition; I do not want incorporation here.

GEORGE KIRKWOOD.

By Mr. Lindsay.—William Kirkwood states: I signed the petition and the counter petition; I want my name to be kept off the petition and kept on the counter petition; I now find that I signed a leaf which is not properly a part of the original petition, so that strictly speaking my name does not appear to the original petition.

his
WILLIAM × KIRKWOOD.
mark

By Mr. Lindsay.—Gilbert Anderson states: I signed the petition and the counter petition; I want my name taken off the petition and kept on the counter petition; I do not want incorporation.

By Mr. Melville.—I cannot say that the counter petition was ever read to me; I do not recollect that part of it that says there is an admirably kept road running through the proposed Municipality; I do not know whether it is a good road or not; I do not know how much of it is metalled; the houses generally about here are some good, some bad, some large, some small; I have a first-class road past my place; it would be hard to tell a road here from an allotment; the roads about Taylor's hotel are pretty fair; I signed the petition in favour of incorporation through rashness; I signed the counter petition because I do not want any incorporation; I do not know where the well-kept main road is referred to in the counter petition; I knew very little about anything when I signed the counter petition; the counter petition may have been read to me before I signed it.

GILBERT ANDERSON.

Adjourned until to-morrow at 10 o'clock a.m.

Glebeland, 10 April, 1885.

By Mr. Lindsay.—Enoch Evans states: I signed the petition and also the counter petition; I want my name to be kept on the counter petition and taken off the petition; I am against incorporation.

By Mr. Melville.—Mr. Patterson saw me sign the counter petition, Griffiths and Lovell saw me sign the petition; I did not ask any one for payment for signing.

ENOCH EVANS.

By

By Mr. Lindsay.—Alice Helm states: I signed the petition as Mrs. Helm; I now look at the signature, that is mine; it is Mrs. Helm, her mark; I put the mark to it; I then was not an owner or lessee or occupier of any property in the proposed Municipality; I did not know that I should have any qualification before I signed; they said they were going to make roads, and so I signed in favour of incorporation; Mr. Peter Fisher owns the house I live in; I am not the mistress of the house, I am only the housekeeper for Mr. Fisher; Mr. Fisher owned the house for about fifteen months past.

By Mr. Melville.—I was the landlady before Fisher purchased the house; he then lived in the house; I did not tell Mr. Lovell or Mr. Griffiths that I was the landlady when I signed.

her
ALICE × HELM.
mark

By Mr. Lindsay.—John Fisher states: The signature I look at to the counter petition is mine.

By Mr. Melville.—Mr. Lindsay and another were present when I signed.

JOHN FISHER.

By Mr. Lindsay.—John Jones states: I signed the petition and the counter petition; I am against incorporation, and want my name to be kept to the counter petition and taken off the petition; no one was present but John Griffiths when I signed the petition; I now look at my mark to the signature to it; no one read the petition to me before I signed it.

By Mr. Melville.—I knew what I signed; Griffiths explained to me what I was signing for; Mr. Lindsay asked me to sign against incorporation, and I did so; he did not tell me anything about a reference to an admirably kept road; I know the main road here; it is not a very good one nor a very bad one; the roads generally are good enough for the place, and good enough for me; my house is a pretty fair one; it is of slabs.

his
JOHN × JONES.
mark

By Mr. Lindsay.—David Jones states: I signed the petition by my mark; I now look at that mark; I also signed the counter petition; I want my name to be kept to the counter petition and taken off the petition; I am against incorporation; the persons who brought me the petition read some paper to me, but I did not understand it; I am a Welshman, and have not good English.

his
DAVID × JONES.
mark

By Mr. Melville.—Thomas Craig states: I signed the petition and the counter petition; I now look at my mark to the name on the petition; I made the mark and that is my name to it; I want my name to be taken off the petition and kept on the counter petition; I do not want any incorporation; I did not see Lovell when I signed the petition; if he had been present I must have seen him; if Mr. Lovell has declared that that is my mark it is the truth; I now look at it on the petition; I have had no conversation with Mr. Lindsay about this inquiry.

his
THOMAS × CRAIG.
mark

By Mr. Lindsay.—Thomas Griffiths states: I signed the petition and the counter petition; I am against incorporation, and I want to have my name struck off the petition and left on the counter petition; I live at Glebeland, the roads are pretty fair about here; I have not seen the road past the "Glebe Colliery Hotel" for some months; the roads are fit to travel over in wet weather; they are fit for children to travel on so far as I know; it is a good road from my place to the pit.

his
THOMAS + GRIFFITHS.
mark

By Mr. Lindsay.—William Lewis states: I signed the petition and the counter petition; I want my name to be taken off the petition and kept on the counter petition; I do not want any incorporation here.

By Mr. Melville.—The only road I travel is the railway line; between the line and my house the road is passable; there are some creeks in the roads; the main road is pretty fair near the "Travellers' Rest Hotel"; I saw no waterholes in it.

WILLIAM LEWIS.

By Mr. Lindsay.—William Campbell states: I signed the petition and the counter petition; I am against incorporation, and want my name kept on the counter petition and taken off the petition; when I signed the petition, the person who had charge of the petition told me it was a paper to get good roads; I did not intend to submit to taxation; the petition was not read by or to me.

By Mr. Melville.—The roads near my place are pretty fair; the road near the Glebe Colliery is passable; there are no creeks continually running in the roads; there is a dry creek 2 feet wide and 1 foot deep in the road near the hotel and in the street; I took it for granted that the statement in the counter petition about the main road was true; it is not safe to travel on foot over the railway line; I refuse to go now and inspect the main road.

WILLIAM CAMPBELL.

By Mr. Melville.—Constable Porter states: I gave evidence on Tuesday last to the effect that I did not know any householder named John Gardner here, also in respect of Daniel Phillip to the same effect; since then I have discovered that there is another man of the name of John Gardner, and that he was a householder in the proposed Municipality at the time the counter petition was going round for signature; I am also able to say the same in respect of Daniel Phillips; he has left the district some time; but there was a householder here I find of that name when the signatures were being taken.

EDWIN PORTER, Constable.

By Mr. Melville.—Robert Simpson states: I have just examined the main road from the "Travellers' Rest Hotel" to the Mechanics' Institute; I find two streams of water running in ruts from 12 to 18 inches deep and from 3 to 4 feet wide; eastward from the Institute towards Newcastle I find two streams running in a serpentine course; about 200 yards below the Institute the two streams unite and continue a similar course and form a stream of water 12 or 14 feet wide; I could not reach the metalled part of the road without crossing that stream, therefore I consider the main road utterly impassable for foot passengers, and it is unfit for traffic of vehicles; the roads in general all through the proposed Municipality are bad.

ROBERT SIMPSON.

Alexander Lindsay states: I have just examined the main road in the Municipality which is referred to in the counter petition; it has been raining these two days; I have taken nine cross measurements of the worst part of the road opposite; the "Travellers' Rest Hotel" I find a drain on the south side of the road 2 feet wide and 2 inches deep in the centre; on the north side I find a drain 2 feet wide, with the usual batter and a centre depth of water 1 inch; the average width of the drain on the north side is 18 inches, and the average dip of the water is 2 inches; the dip of the drain is 15 inches; then 11 yards towards the east the measurement is about the same, but 22 yards from the south side of the street there is an old waterway on flat ground about ¾ of an inch deep and 2 feet wide; on the south side of the road there is a drain 2 feet wide, with a centre dip of water 1½ inches with a roadway intervening 11 feet wide between the fence on the south side of the road and the drain referred to; thence to the east, 22 yards, I find the width of the roadway 24 feet from the fence on the south side; then I find a watercourse 2 feet wide with an inch of water in the centre; then towards the north I find a road 34 feet, with a drain 2 feet wide with an average depth of water 2½ inches; then 22 yards further to the east there is a roadway 17 feet wide from the fence on the south side, and a drain 2 feet wide and 1½ inches average depth of water; thence towards the north there is a road 30 feet wide, and a drain 2 feet wide and an average depth of 2½ inches; 22 yards further to the east from the south side of the road there is a roadway 9 feet wide, and then a drain 1 foot wide by an average depth of 1½ inches; then 50 feet wide the road appears on the north side, with a drain 18 inches wide and an average depth of 2 inches. Drains up to this point, I believe, have been cut by the Government, and they run parallel with the fence on the north side, leaving a narrow pathway between the drain and the fence; 18 yards further to the east on the south side I find the road 11 feet wide; thence on the north I find a drain 2 feet wide with an average depth of 1¼ inch; thence on the north the road is 45 feet wide, and a drain 2 feet wide and 1¼ inch average depth; then I find 4 feet of a road on the north side between the drain and the fence; then 22 yards further to the east from the south I find the road 16 feet wide, with a drain on the north 2 feet wide by 1 inch deep; then still on the north there is a road 27 feet wide, and a drain 2 feet wide and 1 inch average depth; further on the north the road is 15 feet wide between the drain and the fence; thence towards the east, 22 yards, the roadway is 5½ feet wide, with a drain 1½ foot wide and a depth of about ¾ of an inch; then by a road 18 feet wide, with a drain on the north 2 feet wide and 1 inch deep; from the drain to the fence there is a roadway 12 feet wide; 22 yards further to the east there is a roadway 42 feet wide, with a drain on the north 2 feet wide and 1½ inch deep; from the drain to the fence there is a roadway 51 feet wide, with a drain on the north 2½ feet wide and 1 inch deep; on the north there is a roadway 9 feet wide; 22 yards further to the east there is a roadway on the south side 15 feet wide; here there is a shallow flat with an average depth of ½ an inch; then there is a space 12 feet wide to the fence; further to the east. 159 yards, I find the road nearly clear of water on the south side, but on the north side the water spreads considerably, because there is no drain there. This then takes us to the metalled portion of the road referred to in the counter Petition; it lies on the west side of Newcastle boundary; these are all cross measurements. Although it has been raining hard for two days, I find the dray and 'bus traffic is not incommoded; they are now passing up and down; from the "Travellers' Rest" to Adamstown a new main Government road is in course of construction; the formation of the whole is nearly completed; it will be a good road when metalled; I am a resident of the Newcastle district, and live close by the proposed Municipality, and have lived there about twenty-five years; I never knew of an accident on this main road; I have travelled over the whole of the proposed Municipality at all times, both by day and night and in all kinds of weather, and never had an accident; the roads in use in the district I have known since they were laid out; upon the whole, I consider them to be good roads, with ordinary weather; the major portion of the roads that are not metalled are covered with grass, and are on the whole much better than those of the Municipality of Newcastle; when there is any water on the road, it is so simply through the want of a small drain. I hand in a copy of Mr. Merewether's lease (*Exhibit C.*).

ALEXANDER LINDSAY,
Mining Engineer.

By Mr. Melville.—Constable Porter states: I served a summons on Robert Patterson (who declared to the signatures in the counter petition) to attend this inquiry; he is not present; I have not seen him here at all during the inquiry; I served the summons by leaving it with his wife at his residence; I left it on the Wednesday; it was for attendance on Thursday and until called upon during the inquiry; his wife said she believed he was drinking; he subsequently told me he would not attend unless he was compelled; he was the worse of liquor then.

EDWIN PORTER,
Constable.

The foregoing evidence was taken and stated before me on the 7th, 8th, 9th, and 10th April, at Glebeland.

A. A. P. TIGHE.

Exhibit A.

Christ Church, Newcastle, 24 November, 1884.

HAVING heard that it is proposed to include the Glebe in the proposed Municipality about to be petitioned for, I wish to state for the information of the tenants on the Glebe, that I, as incumbent, have no power to dedicate any portion thereof for the purpose of making streets, &c.

ARTHUR E. SELWYN.

Exhibit B.

To Messrs. Melville and Luscombe, M.'sL.A.

Gentlemen, Glebeland, 16 January, 1885.

At a most influential and enthusiastic meeting of the inhabitants of the Glebe and Burwood, held in the Mechanics' Institute on Thursday evening last, 9th instant, we, the undersigned, were chosen as a Committee to bring under your notice the very deplorable state of the main road from the top of Glebe Hill towards Burwood Junction, and also to make known the wishes of said inhabitants in reference thereto.

Therefore,

Therefore, for your information, we beg to state,—

1. That some time ago a sum of money was voted for, and is now being spent in the formation of a main road from Adamstown to Glebe. The wisdom of this is fully recognised by the inhabitants of this place, inasmuch as at the late public meeting the following resolution was most unanimously agreed to:—

"That this meeting desires to express its appreciation of the work now being carried out by the Government in making the road from Adamstown to the Glebe; but at the same time would most respectfully draw attention to the fact that unless the road is continued some 300 yards further on the Burwood end the whole distance will be comparatively useless to the inhabitants of this place."

2. To more fully explain the latter portion of the resolution, we further desire to state that the present contract is only from Adamstown to the top of the Glebe Hill, and when completed will leave the eastern slope of the hill, together with the Burwood Road, in the same condition as now.

3. Seeing then that the residents of the Glebe and Burwood will not be benefited by the Adamstown Road, unless it be further extended, we desire that said road be continued across Glebe Hill by a cutting of about 8 feet in depth on the crown, which would make the hill of comparatively easy access. In connection with the cutting, we would bring under your notice the fact that the stuff got from it would be conglomerate rock, which could be used to advantage in making the road from the foot of the hill on the Burwood end.

4. In conclusion, we further beg to state that about fourteen months ago this same subject was brought under the notice of the Roads Department in Sydney, and at the same time a sketch was forwarded showing the various roads in this locality, and the pressing need of the Glebe and Burwood road being made. But this time we have taken the liberty of addressing ourselves to you on the subject. We do so the more readily because we know that you are ever ready to give your valuable services for the furtherance of all matters relating to the prosperity of this district. Knowing that you will do your very best for us in the matter of this road, We remain, &c.,

JOHN DIXON.
GEORGE HALL.
WILLIAM ARMSTRONG.
JOSEPH BOWTELL.
G. ROBERTSON.
JAMES REID.

Exhibit C.

THIS INDENTURE, made the day of , in the year of our Lord one thousand eight hundred and . between Edward Christopher Merewether, of "The Ridge," near Newcastle, in the Colony of New South Wales, Esquire (hereinafter called "Lessor"), of the one part, and of (hereinafter called "Lessee"), of the other part.

WITNESSETH, that in consideration of the rent hereinafter reserved, and of the covenants and the conditions hereinafter contained, and on the part of the lessee to be observed and performed, he, the lessor, doth hereby demise and lease unto the lessee all that piece and parcel of land, more particularly described in the schedule hereunder written; together with all rights, members, easements, appurtenances to the said premises belonging or appertaining, except and reserving out of this demise unto the lessor all mines and minerals whatsoever in and under the said land, with liberty for the lessor to dig, search for, win, convert, remove, and carry away the same; and also excepting and reserving unto the lessor the free running of water and soil in and through the sewers, drains, and channels for the time being in, upon, or under the said land hereby demised or any part thereof; to have and to hold the land and premises hereby demised unto the lessee for the term of sixty-six years, to be computed from the first day of January, one thousand eight hundred and seventy-seven, yielding and paying therefor yearly and every year during the said term the yearly rent of by equal quarterly payments, on the first day of January, first day of April, first day of July, and first day of October in each and every year, the first of such quarterly payments to be made on the first day of April, one thousand eight hundred and seventy-seven, the said rent to be paid clear of all deductions; and also yielding and paying, in the event of and immediately upon the said term being determined by re-entry under the proviso hereinafter contained, a proportionate part of the said rent for the fraction of the current quarter up to the day of such re-entry. And the lessee doth hereby, for himself, his heirs, executors, administrators, and assigns, covenant with the lessor, his heirs and assigns, in manner following (that is to say)—That he, the lessee, will pay unto the lessor the yearly rent hereby reserved on the days and in the manner hereinbefore appointed for the payment thereof, free of all deductions whatsoever; and also will, during the said term, pay also existing and future taxes, rates, assessments, charges, impositions, and outgoings of every description for the time being payable by either landlord or tenant in respect of the said premises, or any messuages or buildings at any time during the said term to be erected and standing thereon; and also will, within the space of six months from the date of these presents, at his, the lessee's own expense, well and sufficiently fence off the land and premises hereby demised from the adjoining property with a good and substantial three-rail fence or a substantial paling fence; and also will, at his own costs and charges, from time to time, and at all times during the said term hereby granted, well and sufficiently repair, maintain, and keep all buildings, erections, and fences which now are or shall at any time hereafter be erected and built upon the said land hereby demised, or any part or parts thereof, and all fixtures and additions, conveniences, and appurtenances thereto belonging, in good and substantial repair and condition in all respects; and also will permit the lessor, or all persons authorized by him, twice in every year during the said term hereby granted, at all reasonable hours of the daytime, and after twenty-four hours' previous notice in writing, to enter into and upon the said premises and every part thereof, to view the condition thereof, and to give or leave notice in writing upon the said premises for the lessee of all defects and wants of repair then and there found; and also that he, the lessee, will, within three calendar months after every or any such notice, well and sufficiently repair and make good such defects and wants of reparation whereof notice shall have been so given or left; and also that it shall be lawful for the workmen of the lessor or his tenants or occupiers of lands, houses, and premises adjoining or near to the land and premises hereby demised, at all reasonable times in the daytime to enter into and upon the said demised premises or any and every part thereof, or any buildings to be erected thereon, for the purpose of making,

making, digging, constructing, cleansing, and repairing any such drains, sewers, and water-courses in, through, upon, or under the said demised premises; and also that the lessor shall have free liberty of water-course in, through, and under the said demised premises, to carry off the water and sewerage from the adjoining or contiguous properties; and also that the lessee will, at all times during the term hereby granted, at his own cost, keep all messuages and buildings now or hereafter to be erected and built on the said land insured in the joint names of the lessor and lessee against loss or damage by fire in some insurance office, to be approved of by the lessor, in the full value of the buildings so insured, and will, when required by the lessor or his agent, produce the policy or policies of such insurance, and the receipt or receipts for the current year's premium or premiums payable for effecting and keeping on foot such insurance; and also will lay out all moneys which shall be received under or by virtue of any such insurance in rebuilding or repairing such part of the said premises as shall have been destroyed or damaged by fire; and also, that the lessee will not carry on or permit to be carried on any noisy, noxious, or offensive art, trade, or business in or upon the said land or any part thereof, or any building to be erected thereon, or do or permit any act, deed, or thing whatsoever which may be an annoyance or disturbance to the lessor or his tenants in the neighbourhood; and also, that he, the lessee, will from time to time, within twenty-one days after every assignment or assurance of the said demised premises shall have been made, at his, the lessee's own expense, deliver to the lessor a copy of such assignment or assurance; and also, that the lessee will, at the expiration or sooner determination of the said term, deliver up to the lessor the land, and all fences, erections, and buildings thereon, and all fixtures and additions thereto, and the appurtenances thereunto belonging, in good, sound, and substantial state, repair, and condition, and in such state and condition as shall be consistent with the due performance of the several covenants hereinbefore contained. And the lessee further covenants with the lessor that it shall and may be lawful for the lessor, or his lessee or lessees, or any person authorized by him from time to time, and at all times hereafter to win, work, carry away, and dispose of the seams, veins, and mines of coal and other mineral beneath the surface of the land demised the person actually exercising such rights, or working the said mines, paying compensation for any damage done to any fences, erections, buildings, crops, or the surface of the said land, by the sinking or the subsidence of the said land, or any part thereof that may arise in consequence of the working of the said mines; but in no case shall the lessor be liable for the acts of his lessees. Provided always, and these presents are upon the express condition that if the rent hereby reserved, or any part thereof, shall be unpaid for the space of twenty-one days next after any of the days whereon the same ought to be paid as aforesaid, although no formal demand shall have been made thereof, or in case of the breach, non-observant, or non-performance of all or any of the covenants hereinbefore contained, and on the lessee's part to be observed and performed, then, and in all or any of the said cases, it shall be lawful for the lessor to re-enter upon any part of the said land and premises in the name of the whole, and the same to have again, re-possess, and enjoy as of his first and former estate, and thereupon the said term of sixty-six years shall absolutely determine, and this present Indenture, except as to any prior breach on the part of the lessee shall be absolutely void and of no effect. Provided always, and it is hereby agreed and declared that it shall and may be lawful for the lessor to resume and take possession of all, or any portion of the said premises which may be required at any time or times hereafter, for the purpose of any railroads, or other roads or ways, on giving to the lessee three calendar months' previous notice in writing of such his desire, and on making full compensation in respect thereof to the lessee; the amount or extent of such compensation, in case of difference, to be settled by arbitration in the usual manner, one arbitrator to be chosen by the lessor and the other by the lessee, which said two arbitrators, before they enter upon such arbitration, shall choose and elect a third, and the decision of such arbitrators, or any two of them, shall be binding and conclusive on all parties. And the lessor doth hereby covenant with the lessee that he, the lessee, paying the rent and observing and performing the several covenants hereinbefore contained, and on the lessee's part to be paid, observed, and performed, shall and may, peaceably and quietly, have, hold, use, occupy, possess, and enjoy the said land and premises, without any eviction, interruption, or denial of, from, or by, the lessor, or any person or persons lawfully claiming by, from, through, under, or in trust for him. And also, that if the said lessee shall be desirous of taking a renewed lease of the said premises for the further term of thirty-three years from the expiration of the term hereby granted, and if such his desire, shall, prior to the expiration of the said term, give to the lessor, or shall leave at his last known place of abode, in the colony of New South Wales, six calendar months' notice in writing, and shall pay the said rent hereby reserved, and observe and perform the several covenants and agreements herein contained, and on the part of the lessee, to be paid, observed, and performed, to the expiration of the term hereby granted, he, the lessor, will, upon the request of the lessee, and at his expense, and on his executing and delivering to the lessor a counterpart thereof, forthwith execute and deliver to the lessee a renewed lease of the said premises for the further term of thirty-three years, at an increased rent equal to fifty pounds per centum upon the rent hereby reserved and otherwise under the subject to the several covenants, provisoes, and agreements herein contained, but not including the present covenant. And it is hereby lastly declared and agreed that the heirs, executors, administrators and assigns of the lessor, and the executors, administrators and assigns of the lessee, shall be bound by and entitled to the benefit of these presents, and the covenants, provisoes, and conditions herein contained, in like manner as if they had been respectively herein named next after the words lessor and lessee respectively throughout as far as the same will admit, and unless the context be repugnant to such construction.

In witness whereof, the said parties to these presents have hereunto set their hands and seals the day and year first above written.

Mr. A. A. P. Tighe to The Principal Under Secretary.

Sir,

Petersham, 21 April, 1885.

I beg to hand you the enclosed letters, which I this day received from Mr. Alexander Lindsay, concerning the recent Inquiry as to the validity of signatures, &c., to Petitions for and against the proposed Municipality of Merewether.

I have, &c.,

A. A. P. TIGHE.

[*Enclosure.*]

[*Enclosures.*]

Mr. Alexander Lindsay to A. A. P. Tighe, Esq.

Sir, Patrick-street, Newcastle, 17 April, 1885.

I have shown Mr. Gorrick the letter I spoke to you about, and he thinks it would be better to forward it on to you, and that you would then be the proper person to forward it on to head quarters, to appear with your report, which I now do.

I have, &c.,
ALEXANDER LINDSAY.

Mr. Alexander Lindsay to A. A. P. Tighe, Esq.

Sir, Patrick-street, Newcastle, 10 April, 1885.

Since my arrival home this afternoon from the Inquiry *re* incorporation of Burwood and Glebeland, I have thought over the question put by Mr. Melville to Constable Porter, after the inquiry was considered closed, as agreed upon between us, about having served Mr. Patterson with a summons, and further, that he did not attend thereat.

Now, from the answer given to the above question, the Executive or the Minister might come to the conclusion that all others attended that were summoned, whereas the following persons were summoned and did not attend:—Alfred Kedwell, James Searl, Neil M'Crimmon, Mrs. Harris, Patrick Dwyer, Minnie Smattel, Mr. Clemens, William Attwood, Thomas Lewis, W. H. Harris, John Crawley, Edward Stallard, Mrs. Wilton, Mrs. Fisher, Mrs. Muck, John Kennedy, &c., although they were all served, for the following reason, brought under your notice personally, that they refused to pay those poor people their wages after keeping them there several days, and as Commissioner you were appealed to and could do nothing for them. Others would not come, as they did not receive any money to enable them to attend, and, as you are aware, they are simply poor hard working men, depending upon their daily wage for the support of themselves and families. By attaching this letter to your report it will give the necessary explanation for the non-attendance of so many.

I have, &c.,
A. LINDSAY,
(For self and counter petitioners.)

I sincerely trust Mr. Tighe will not think that I have any desire to interfere with his report by sending this letter to him; but if he should think so, or disapprove of me doing so through him, I will send it to the Principal Under Secretary; or perhaps Mr. Tighe would oblige me by doing so.—I am, &c., A. LINDSAY.

Proposed Municipality of Merewether.—Scrutineers' Report.

Colonial Secretary's Office, Sydney, 24 April, 1885.

MR. TIGHE finds that, apart from the matter mentioned below, there are 240 for incorporation, and 239 against. But thirty-seven persons signed both Petitions, and he propounds three possible modes of dealing with the matter:—

1. To let the present expressed wishes of the several persons prevail.
2. To take the signatures to the counter Petition (being the later ones) as superseding those to the original Petition.
3. To hold that those who signed the original Petition were thereby precluded from signing the other (here Mr. Tighe suggests a legal question as to the interpretation of the statute).

According to 1 or 2, the counter Petitioners would be in the majority; according to 3, the original Petition would prevail.

Under the report of Mr. Tighe the original Petition might, I think, prevail, and the necessary steps be taken for the incorporation of Merewether.—C.W., 25/4/85. Approved.—W.B.D., 25/4/85.

Minute Paper for the Executive Council.

MUNICIPAL DISTRICT OF MEREWETHER—INCORPORATION.

Colonial Secretary's Office, Sydney, 27 April, 1885.

THE substance and prayer of the accompanying Petition from 243 persons, described as persons liable upon incorporation to be assessed for Municipal taxes, praying for the incorporation of a Municipality to be called the Municipal District of Merewether, have been published in the Government Gazette, and otherwise, for the period prescribed by section 10 of the Municipalities Act of 1867.

2. A counter Petition signed by 251 persons, described as similarly liable, praying that such incorporation may not be granted, has also been received and published.

3. As, however, the result of an inquiry held by A. A. P. Tighe, Esq., under section 12 of the Municipalities Act has been to show a majority in favour of the Petition for incorporation, I recommend the issue of a proclamation declaring the proposed Municipality to be a Municipal District by the above name, and defining the limits and boundaries thereof, in accordance with the provisions of the aforementioned 10th section of the Act above cited.

WILLIAM B. DALLEY.

Minute of Executive Council.

THE Executive Council having fully considered the Petitions herewith submitted, together with the report of Mr. Tighe, advise that a proclamation be issued incorporating the area referred to by the name of the Municipal District of "Merewether," in terms of the 10th section of "The Municipalities Act of 1867."

ALEX. C. BUDGE,
Clerk of the Council.

Approved.—A.L., 12/5/85. Min. 83-13, 12/5/85.—Confirmed, 21/5/85.

Telegram from Mr. J. A. Gorrick, M.P., to The Colonial Secretary.

Newcastle, 28 April, 1885.

WITH much respect, would ask you to reconsider Tighe's report respecting incorporation of Merewether. There must be serious error somewhere, and people are more than surprised; there is a considerable majority of authentic signatures against incorporation. Will you meet deputation, and when.

Will receive deputation Friday week.—C.W., 28/4/85.

Telegram

Telegram from Principal Under Secretary to Mr. J. A. Gorrick, M.P.

29 April, 1885.

Colonial Secretary will receive deputation regarding Merewether incorporation on Friday week, 8th May, 11 o'clock.

Mr. J. A. Gorrick, M.P., to The Colonial Secretary.

My dear Mr. Dalley, Bolton-street, Newcastle, 6 May, 1885.

Mr. Alex. Lindsay (one of the chief members of our deputation *re* Merewether Incorporation Petitions) will call at your office for the purpose of perusing Mr. Tighe's report. I presume that a member of the deputation seeing it a few hours before the formal interview will make no difference, but it will have the advantage of shortening the formal interview by enabling us to strictly confine ourselves to the bare points which the report will put in issue, of which, however, we will not be aware without some or one of us seeing the report beforehand.

I remain, &c.,

J. A. GORRICK.

[*Extract from "Sydney Morning Herald, dated 9th May,* 1885.]

Incorporation of Merewether.

Two deputations waited simultaneously upon Mr. Wright (for Mr. Dalley) yesterday in reference to the incorportion of a place called Merewether, situated to the south of and near to Newcastle. One deputation, in favour of incorporation, was introduced by Mr. Melville, M.L.A., and Mr. Luscombe, M.L.A. The other, in opposition, was introduced by Mr. Levien, M.L.A. (for Mr. Gorrick) and Mr. Mitchell, M.L.A.

Mr. Wright, after very patiently hearing both sides, said that a Petition had been sent in to the Government for the incorporation of Merewether, and a counter Petition was sent in against it, with an apparent majority.

As there appeared to be some dispute about the Petitions, the Government appointed Mr. A. A. P. Tighe, to inquire into the circumstances, in pursuance of the 12th section of the Municipalities Act. Mr. Tighe, having held an exhaustive inquiry, sent in a report, in which he found that the original Petition had 240 genuine signatures, and the counter Petition had only 239. But there were twenty-nine persons who had signed the counter Petition after signing the original one, and therefore were clearly not entitled to any consideration with regard to the second Petition. This would of course make a majority of thirty in favour of the original Petition. Mr. Dalley had settled the matter by a minute, which was now ready to go before the Executive Council, recommending the incorporation of this locality. His own opinion was that the incorporation of this locality would be a great boon to the inhabitants who were engaged in working the coal mine, and who had a right to good streets and proper sanitary arrangements. He would submit to his Colleague, Mr. Dalley, all that had been said on both sides, but he would not advise that gentleman to reverse the decision that he had already arrived at, or to re-open the question.

Will the Under Secretary for Lands kindly obtain and furnish for proclaimation a technical description of the boundaries of the proposed Municipality.—The Under Secretary for Lands,—B.C., 26 May, 1885. J.B. for P.U.S. The Surveyor General.—F.H.W., for Under-Secretary, 28/5/85.

Proposed Municipal District of Merewether.

It is submitted for the consideration of the Secretary for Lands that the Petition for a Municipality at Merewether be forwarded for the special consideration of the Colonial Secretary, attention being invited to the erroneous and indefinite nature of the description which has made it exceedingly difficult to determine the lands that were intended to be included.

The starting point of the description is from the southern extremity of the east boundary of E. C. Merewether's 950 acres, and thence on part of the south by the summit of a dividing ridge north-westerly to the west boundary of the last-named measurement. As there are two ridges, one extending from the south-east corner of the land referred to, and the other from a point on the south-east boundary of the grant immediately north of its south boundary, it is believed that the former range is that which was referred to.

Further, the description is continued from the west boundary of E. C. Merewether's 950 acres, bearing north to the south-west corner of the village of Adamstown, whereas a north line from the last-mentioned point would strike the south-east corner instead of the south-west of Adamstown, and exclude land which it was probably intended to include.

It is submitted that it be ascertained what lines should be adopted in defining the south and west boundaries of the proposed Municipality.

G. LEWIS, for the
SURVEYOR GENERAL,
1 June, 1885.

Urgent. Recommendation submitted for approval.—J.B., 1/6/85. Approved.—F.A.W., 1/6/85. The Principal Under Secretary.—C.O., Department of Lands, B.C., 2 June, 1885. The Under Secretary for Lands, B.C., 5 June, 1885.—J.B., for P.U.S. Submitted.—The description supplied by the Petitioners is clearly erroneous. But it is possible that Mr. Lewis (who is going shortly to the northern districts) may be able to verify the intended boundaries by personal inspection, if the Surveyor General instructs him to do so. The papers might be referred to the Secretary for Lands with that view. 3 June, 1885. Approved.—A.S., 5/6/85.

The

The Surveyor General.—J.E., 9/6/85. Mr. Geo. Lewis, 10/6/85, M.A.

As requested by the Colonial Secretary, I made a personal inspection of the boundaries intended to be included within the proposed Municipal District of Merewether, and enclose a description of the boundaries cleared and marked on the ground, and which can readily be followed. A sketch can be prepared for the information of the Municipality after incorporation, should they so desire.—G. Lewis, 7 July, 1885.

County of Northumberland, parish of Newcastle, area, 1,114 acres: Commencing at the south-east corner of James Mitchell's, now E. C. Merewether's 953 acres; bounded thence on part of the west by part of the east boundary of that portion bearing north 41 minutes west 25 chains 26 links to a main dividing ridge; thence generally on the south by lines bearing—

North	26	degrees	59	minutes	west	8	chains	3 links
do	36	do	57	do	do	8	do	55 do
do	66	do	22	do	do	14	do	22 do
do	87	do	1	do	do	4	do	99 do
south	72	do	32	do	do	3	do	46 do
do	63	do	13	do	do	7	do	27 do
do	85	do	29	do	do	7	do	23 do
do	56	do	26	do	do	10	do	63 do
do	23	do	28	do	do	6	do	42 do
do	48	do	56	do	do	2	do	95 do
do	74	do	34	do	do	9	do	60 do
do	70	do	9	do	do	5	do	33 do
north	70	do	55	do	do	5	do	69 do

to the east boundary of James Mitchell's, now E. C. Merewether's portion No. 177 of 413¾ acres; thence on the south-west by a line bearing about north 39 degrees 38 minutes west 85 chains 50 links, to the south-west corner of portion No. 7 Thomas Adams's 54 acres; thence on part of the north by the south boundary of that portion bearing north 89 degrees 33 minutes east 52 chains 53 links; on the remainder of the west by its east boundary bearing north 5 minutes west 10 chains 52 links to its north-east corner; thence on the remainder of the north by part of the south boundary of the Australian Agricultural Company's 2,000 acres, which forms part of the south boundary of the Municipal District of Hamilton, proclaimed 11th December, 1871, being lines bearing about south 79 degrees 14 minutes east 5 chains 11 links, and about north 89 degrees 4 minutes east 111 chains to a north-west boundary of the Municipality of Newcastle, as proclaimed 8th September, 1871; thence by part of that boundary south-westerly to its southern extremity; thence on the north-east by a south-west boundary of that Municipality south-easterly to the shore of the Pacific Ocean; thence by the Pacific Ocean south-westerly, to the point of commencement. Shown in plan catalogued M. 1-2,398 in the Surveyor General's Office, Sydney.

The Under-Secretary for Lands.—P. F. Adams, 8 July, 1885. The Principal Under-Secretary.—C.O., B.C., 8/7/85. For Proclamation, 10/7/85. Proclamation published in Supplementary Government Gazette, No. 355 of 20th August, 1885—*Newcastle Herald* and *Newcastle Despatch* 27th August, 1885.

New South Wales, } Proclamation by His Excellency The Right Honorable Lord Augustus William
to wit. } Frederick Spencer Loftus, Knight Grand Cross of the Most Honorable Order
(L.S.) of the Bath, a Member of Her Majesty's Most Honorable Privy Council,
Augustus Loftus, Governor and Commander-in-Chief of the Colony of New South Wales and its
Governor. Dependencies.

Whereas the Municipalities Act of 1867 provides for the constitution of a Municipality, on receipt of a Petition signed by not fewer than fifty persons, who would upon incorporation be liable to be assessed for Municipal taxes in respect of property or household residence within the area proposed to be so incorporated: And whereas a Petition signed by two hundred and forty-three persons liable to be so assessed upon such incorporation has been received by the Governor, praying for a Municipality, to be styled the "Municipal District of Merewether": And whereas the substance and prayer of such Petition have been duly published in the Government Gazette and otherwise, in accordance with the said Act: Now, therefore, I, Lord Augustus William Frederick Spencer Loftus, the Governor aforesaid, in pursuance of the provisions of the said Act, and with the advice of the Executive Council, do, by this my Proclamation, declare that the area hereinafter described shall be and the same is hereby constituted a Municipality under the name and style of the Municipal District of Merewether, viz.:—

County of Numberland, parish of Newcastle, area 1,114 acres: Commencing at the south-east corner of James Mitchell's, now E. C. Merewether's, 950 acres; bounded thence on part of the west by part of the east boundary of that portion bearing north 41 minutes west 25 chains 26 links to a main dividing ridge; thence generally on the south by lines bearing north 26 degrees 59 minutes west 8 chains 3 links, north 36 degrees 57 minutes west 8 chains 55 links, north 66 degrees 22 minutes west 14 chains 22 links, north 87 degrees 1 minute west 4 chains 99 links; south 72 degrees 32 minutes west 3 chains 46 links, south 63 degrees 13 minutes west 7 chains 27 links, south 85 degrees 29 minutes west 7 chains 23 links, south 56 degrees 26 minutes west 10 chains 63 links, south 23 degrees 28 minutes west 6 chains 42 links, south 48 degrees 56 minutes west 2 chains 95 links, south 74 degrees 34 minutes west 9 chains 60 links, south 70 degrees 9 minutes west 5 chains 33 links; north 70 degrees 55 minutes west 5 chains 69 links to the east boundary of James Mitchell's, now E. C. Merewether's, portion No. 177 of 413¾ acres; thence on the south-west by a line bearing about north 39 degrees 38 minutes west 85 chains 50 links to

the

the south-west corner of portion No. 7, Thomas Adams's 54 acres; thence on part of the north by the south boundary of that portion bearing north 89 degrees 33 minutes east 52 chains 53 links; on the remainder of the west by its east boundary bearing north 5 minutes west 10 chains 52 links to its north-east corner; thence on the remainder of the north by part of the south boundary of the Australian Agricultural Company's 2,000 acres, which forms part of the south boundary of the Municipal District of Hamilton, proclaimed 11th December, 1871, being lines bearing about south 79 degrees 14 minutes east 5 chains 11 links, and about north 89 degrees 4 minutes east 111 chains to a north-west boundary of the Municipality of Newcastle, as proclaimed 8th September, 1871; thence by part of that boundary south-westerly to its southern extremity; thence on the north-east by a south-west boundary of that Municipality south-easterly to the shore of the Pacific Ocean; thence by the Pacific Ocean south-westerly, to the point of commencement.

Given under my Hand and the Seal of the Colony, at Government House, Sydney, this twentieth day of August, in the year of our Lord one thousand eight hundred and eight-five, and in the forty-ninth year of Her Majesty's Reign.

By His Excellency's Command,
ALEX. STUART.

GOD SAVE THE QUEEN!

The Principal Under Secretary to Mr. Daniel Conway, and the other Gentlemen who signed the Counter Petition.

Gentlemen, Colonial Secretary's Office, Sydney, 20 August, 1885.

Referring to my letter of the 19th March last, concerning the appointment of Mr. A. A. P. Tighe to make inquiry, under section 12 of the Municipalities Act of 1867, into the Petition for and counter Petition against the incorporation of a Municipality to be called the Municipal District of Merewether, I am now directed by the Colonial Secretary to inform you that the report of Mr. Tighe having been furnished, His Excellency the Governor, with the advice of the Executive Council, has been pleased, by a proclamation published in a Supplementary Government Gazette of this date, to constitute the Municipal District of Merewether under the provisions of the Municipalities Act.

I have, &c.,
CRITCHETT WALKER.

From the Principal Under Secretary to Mr. John Young and other Gentlemen who signed the Petition for Incorporation

Gentlemen, Colonial Secretary's Office, Sydney, 20 August, 1885.

Referring to my letter of the 19th of March last, respecting the Petition praying for the incorporation of a Municipaity, to be called the Municipal District of Merewether, I am now directed by the Colonial Secretary to state that His Excellency the Governor, with the advice of the Executive Council, has been pleased, by a proclamation published in a Supplementary Government Gazette of this day's date, a copy of which is enclosed, to constitute such Municipality accordingly.

2. I am further desired to point out that the 65th section of the "Municipalities Act of 1867" provides that the first election of Aldermen and Auditors shall take place within three months from the date of incorporation, and to request that you will fix a day not earlier than the middle of October next, for the holding of the Merewether election, and communicate the same to me, as well as the name of the place where the election is to be held, with the least possible delay.

3. The name in full, of some gentleman duly qualified as an elector, and willing to Act as first Returning Officer, should be furnished at the same time.

I have, &c.,
CRITCHETT WALKER.

The Principal Under Secretary to The Under Secretary for Justice.

Sir, Colonial Secretary's Office, Sydney, 20 August, 1885.

I am directed by the Colonial Secretary to state for the information of the Minister of Justice, that a proclamation has been published in a Supplementary Government Gazette of the present date, incorporating a Municipality to be called the Municipal District of Merewether.

I have, &c.,
CRITCHETT WALKER.

Sydney: Thomas Richards, Government Printer.—1885.

[1s. 6d.]

281—E

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

MUNICIPALITIES ACT AMENDMENT BILL.

(PETITION IN FAVOUR OF—BOROUGH COUNCIL OF WOOLLAHRA.)

Received by the Legislative Assembly, 24 September, 1886.

To the Honorable the Speaker and the Members of the Legislative Assembly.

The Petition of the Borough Council of Woollahra,—

SHOWETH:—

That your Petitioners notice that a Bill has been sent to you from the Legislative Council to amend the Municipalities Act so as to give power to municipalities to appoint a polling-place within the boundaries of the city of Sydney, in addition to the polling place or places to be appointed by the Returning Officer under the provisions of the Principal Act.

That the provision sought to be introduced is very desirable and necessary, as at present time very many electors are disfranchised by reason of their not being able to vote locally.

Your Petitioners therefore humbly pray that the Bill may have your favourable consideration and support.

And your Petitioners, as in duty bound, will ever pray.

For and on behalf of the Borough Council of Woollahra.

W. J. TRICKETT,
Mayor.

[3*d*.] 943—

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

MUNICIPALITIES ACT AMENDMENT BILL.

(PETITION IN FAVOUR OF—MUNICIPAL COUNCIL OF BOROUGH OF VICTORIA.)

Received by the Legislative Assembly, 5 October, 1886.

To the Honorable the Speaker and the Honorable the Members of the Legislative Assembly of New South Wales, in Parliament assembled.

The Petition of the undersigned Mayor and Aldermen of the Municipal Council of the Borough of Victoria,—

HUMBLY SHOWETH:—

1st. That a Bill called "A Bill to amend the Municipalities Act of 1867" is now before your Honorable House, having been transmitted thereto from the Honorable the Legislative Council, which passed the measure without amendment.

2nd. That in consequence of a decision of the Supreme Court of New South Wales, a large number of ratepayers will be disfranchised by reason of the establishment of polling-places in Sydney or Suburban Municipalities having been declared illegal.

3rd. Your Petitioners therefore humbly pray that your Honorable House will pass the said Bill during present Session.

And your Petitioners, as in duty bound, will ever pray.

[*Here follow* 5 *signatures.*]

Similar Petitions were received:—

On 8th October, 1886, from the Mayor and Aldermen of the Municipal Council of Balmain; 1 signature.

On 8th October, 1886, from the Mayor and Aldermen of the Municipal Council of Waverley; 1 signature.

On 8th October, 1886, from the Mayor and Aldermen of the Municipal Council of Five Dock; 1 signature.

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

MUNICIPALITIES.

(AMOUNTS PAID AS ENDOWMENTS TO, FROM 1867 TO 1885.)

Ordered by the Legislative Assembly to be printed, 19 *May,* 1886.

RETURN to an *Order* of the Legislative Assembly, dated 25th March, 1886, That there be laid upon the Table of this House, a Return showing,—

"(1.) The amounts paid as Endowments to Municipalities, whether "ordinary or special, in each year from 1867 to 1885 inclusive.

"(2.) The payments from the Treasury during the same period, for the "preliminary expenses of Municipal Institutions."

(*Mr. Burns.*)

[NOTE.—Part No. 1 of this Return is incorporated in a Return—"*Endowments to Municipalities*"—laid upon the Table simultaneously with this.]

STATEMENT of Payments on account of preliminary expenses of Municipal Institutions, from 1867 to 1885 inclusive.

	£	s.	d.
1867... ...	45	13	6
1868... ...	130	14	1
1869... ...	82	6	9
1870... ...	80	5	6
1871... ...	483	18	3
1872... ...	480	13	1
1873... ...	86	11	2
1874... ...	156	2	11
1875... ...	15	18	9
1876... ...	216	12	10
1877... ...	119	15	4
1878... ...	106	13	0
1879... ...	194	8	5
1880... ...	100	5	6
1881... ...	76	7	6
1882... ...	119	8	6
1883... ...	287	18	0
1884... ...	226	3	9
1885... ...	397	18	8
Total... ...	£3,407	15	6

The Treasury,
24th April, 1886.

J. PEARSON,
Accountant.

[805 copies—Approximate Cost of Printing (labour and materials), £1 4s. 9d.]

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

MUNICIPALITIES.

(AMOUNTS AUTHORIZED AS ENDOWMENTS TO, FROM 1867 TO 1885.)

Ordered by the Legislative Assembly to be printed, 19 *May*, 1886.

RETURN to an *Order* of the Legislative Assembly, dated 25th March, 1886, That there be laid upon the Table of this House,—

"A Return, in tabular form, showing the amount authorized to be appropriated for Endowments to Municipalities in each year, from 1867 to 1885 inclusive, and distinguishing the special from the ordinary Endowments under the Municipalities Act."

(*Mr. Burns.*)

[NOTE.—Part No. 1 of Return—"*Endowment to Municipalities, Municipal Institutions*"—is incorporated in the within Return.]

STATEMENT showing the amounts appropriated for Endowments to Municipalities since the passing of the Municipalities Act of 1867, and the amounts paid therefrom to 31st December, 1885.

Year.	Appropriations.			Expenditure.		
	Under Municipalities Act of 1867.	Special Appropriations.	Total.	Payments under Municipalities Act of 1867.	Special Grants.	Total.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1867	18,000 0 0	.....	18,000 0 0	15,396 19 1	.....	15,396 19 1
1868	20,000 0 0	.....	20,000 0 0	19,329 6 6	.....	19,329 6 6
1869	20,000 0 0	.....	20,000 0 0	19,122 12 9	.....	19,122 12 9
1870	20,000 0 0	.....	20,000 0 0	15,104 12 7	.....	15,104 12 7
1871	20,000 0 0	.....	20,000 0 0	15,318 17 0	.....	15,318 17 0
1872	20,000 0 0	.....	20,000 0 0	19,724 16 11	.....	19,724 16 11
1873	20,000 0 0	.....	20,000 0 0	18,703 2 8	.....	18,703 2 8
1874	21,380 2 5	.....	21,380 2 5	21,380 2 5	.....	21,380 2 5
1875	25,000 0 0	.....	25,000 0 0	22,129 8 8	.....	22,129 8 8
1876	25,000 0 0	.....	25,000 0 0	17,798 14 10	.....	17,798 14 10
1877	60,000 0 0	69,376 6 4	129,376 6 4	21,431 11 8	65,790 7 10	87,221 19 6
1878	20,000 0 0	34,075 14 8	54,075 14 8	16,028 4 10	34,318 1 1	50,346 5 11
1879	20,000 0 0	76,430 12 4	96,430 12 4	16,513 16 5	76,230 12 4	92,744 8 9
1880	20,000 0 0	41,164 1 8	61,164 1 8	16,839 0 4	41,164 1 8	58,003 2 0
1881	20,000 0 0	50,000 0 0	70,000 0 0	16,957 11 3	47,903 3 4	64,860 14 7
1882	20,000 0 0	50,000 0 0	70,000 0 0	16,192 5 10	50,000 0 0	66,192 5 10
1883	20,000 0 0	105,000 0 0	125,000 0 0	17,958 13 9	78,942 17 11	96,901 11 8
1884	21,251 2 1	61,774 0 3	83,025 2 4	21,251 2 1	61,774 0 3	83,025 2 4
1885	22,718 17 7	65,000 0 0	87,718 17 7	22,718 17 7	69,221 18 6	91,940 16 1
Totals £	433,350 2 1	552,820 15 3	986,170 17 4	340,899 17 2	525,345 2 11	875,245 0 1

The Treasury, 24th April, 1886.

J. PEARSON,
Accountant.

[3*d.*] 481—

[805 copies—Approximate Cost of Printing (labour and material), £1 14s. 6d.]

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

MUNICIPALITIES.

(ENDOWMENTS TO BALMAIN, LEICHHARDT, GLEBE, REDFERN, WATERLOO, ALEXANDRIA, NEWTOWN, PADDINGTON, AND WAVERLEY, FOR 1886.)

Ordered by the Legislative Assembly to be printed, 14 *October*, 1886.

[*Return in reply to the question put to the Colonial Treasurer by Mr. Sutherland, in the Legislative Assembly, on 8th October*, 1886.]

WHAT amount has been paid as endowment to the following Municipalities for the year 1886:—Balmain, Leichhardt, Glebe, Redfern, Waterloo, Alexandria, Newtown, Paddington, Waverley; and the date of payment in each case?

STATEMENT of amounts paid to the undermentioned Municipalities during 1886.

Date.	Municipalities.	Amount.
1886.		£ s. d.
	Balmain...	Nil.
18 May and 20 Sept.	Leichhardt	2,728 6 3
15 Sept.	Glebe	3,296 9 9
	Redfern...	Nil.
21 „	Waterloo	1,472 17 5
16 „	Alexandria	1,196 2 5
	Newtown	Nil.
13 „	Paddington	3,333 3 0
10 „	Waverley	1,849 9 5

The Treasury, New South Wales,
October 12th, 1886.

J. PEARSON,
Accountant.

[3d.] 999—

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

MUNICIPALITIES.

(ALIGNMENT OF STREETS—PARTICULARS OF, WITHIN TEN MILES OF SYDNEY.)

Ordered by the Legislative Assembly to be printed, 14 September, 1886.

RETURN to an *Order* made by the Honorable the Legislative Assembly of New Wales, dated 4th June, 1886, That there be laid upon the Table of this House, a Return showing:—

"(1.) The name of each Municipal Borough within 10 miles of Sydney, the "streets of which have been aligned.

"(2.) The total length of the streets so aligned.

"(3.) The cost of the alignment of each Borough.

"(4.) The total cost borne by each Borough.

"(5.) The length of the streets in each Borough, completed and aligned.

"(6.) The length of the streets in each Borough, the alignment of which "has not been completed."

(Mr. Abbott.)

RETURN affording information with reference to Alignment of Streets in Boroughs within 10 miles of Sydney.

1. Streets have been aligned in the Boroughs of Alexandria, Ashfield, Balmain, Burwood, Camperdown, Canterbury, Darlington, East St. Leonards, Five Dock, Glebe, Hunter's Hill, Leichhardt, Marrickville, Manly, M'Donald Town, Newtown, North Willoughby, Paddington, Petersham, Randwick, Redfern, Ryde, St. Leonards, St. Peters, Victoria, Waterloo, Waverley, West Botany, and Woollahra.

2. The total length of streets so aligned is 518½ miles approximately.

3. The cost of the alignment of each Borough cannot be stated because the surveys have extended over a period of more than 20 years, and no special record of the cost has been kept. The streets involving the most searching investigation, and in the survey and definition of which the greatest difficulties were known to exist and had to be encountered, have now been aligned, and very few such remain to be dealt with; the cost of survey in these cases has reached an average of £30 per street, while ordinary cases average very much less, and it is estimated that the cost of present and future surveys will range between £11 and £30, and the average cost will probably be under £20 per street.

4. No direct contribution towards the cost of alignment surveys is made by the Boroughs, but they are required to provide and erect at their own cost, under the supervision of the surveyor, substantial alignment-posts or stone blocks for the permanent marking of the survey.

5.

[805 copies—Approximate Cost of Printing (labour and material), £1 12s. 3d.]

891—

5. The length of streets surveyed for alignment in each Borough is, approximately :—

	Miles.	Chains.		Miles.	Chains.
Alexandria	5	2	Newtown	16	64
Ashfield	33	75	North Willoughby	41	53
Balmain	19	59	Paddington	11	56
Burwood	18	50	Petersham	14	30
Camperdown	7	76	Randwick	41	25
Canterbury	40	7	Redfern	10	12
Darlington	1	8	Ryde	48	18
East St. Leonards	7	23	St. Leonards	16	55
Five Dock	22	0	St. Peters	11	1
Glebe	10	74	Victoria	5	56
Hunter's Hill	17	0	Waterloo	7	43
Leichhardt	12	6	Waverley	28	26
Marrickville	20	25	West Botany	9	35
Manly	13	43	Woollahra	20	65
M'Donald Town	5	12			

6. The length of streets in each Borough which may yet require to be aligned cannot be given as it depends upon the number of streets dedicated in private subdivisions from time to time, but it may be stated that in most of the Boroughs quoted the greatest number of the streets provided in the original Government subdivisions has by this time been either aligned or surveyed for alignment.

Sydney : Thomas Richards, Government Printer.—1886.

[3*d*.

1885-6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF BALMAIN—BY-LAW.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 153.

Colonial Secretary's Office,
Sydney, 29th October, 1885.

BOROUGH OF BALMAIN—BY-LAW.

THE following By-law, made by the Council of the Borough of Balmain, relating to persons loitering in public places within the Municipality, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the "Municipalities Act of 1867."

P. A. JENNINGS.

BY-LAW OF THE BOROUGH COUNCIL OF BALMAIN.

ANY person or persons standing or loitering upon or near any of the streets, footways, or other public places within the Borough of Balmain, to the inconvenience or annoyance of the passers-by or residents, or in any way interrupting or impeding the traffic, shall discontinue doing so upon and at the request of the Mayor, or any Alderman, officer, or servant of the Council, or any Police Officer stationed within the said Borough; and any person or persons so offending and refusing or neglecting to remove or disperse when requested as aforesaid, shall for every such offence, upon conviction, forfeit or pay a penalty or sum of not less than ten shillings or exceeding five pounds.

Made and passed by the Council of the Borough of Balmain, this twenty-fourth day of March, in the year of our Lord one thousand eight hundred and eighty-five.

(L.S.) J. GARRARD,
Mayor.

H. B. MACINTOSH,
Council Clerk.

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF PETERSHAM—BY-LAW.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 29th October, 1885.

BOROUGH OF PETERSHAM.—BY-LAW.

THE following additional By-law, made by the Council of the Borough of Petersham, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the "Municipalities Act of 1867."

P. A. JENNINGS.

BOROUGH OF PETERSHAM.—ADDITIONAL BY-LAW.

No person shall use, drive, or conduct any vehicle along any street or roadway within the said Borough between sunset and sunrise without carrying a light upon some conspicuous part of such vehicle, in such a manner as that the same shall be distinctly visible to persons either meeting or following such vehicle. Any person committing a breach of this By-law will be liable to a penalty not exceeding ten pounds nor less than ten shillings.

Passed by the Council of the Borough, on the twenty-eighth (28th) day of July, 1885.

(L.S.) WM. LOVEL DAVIS,
Mayor.

AUBREY MOWLE,
Council Clerk.

1885-6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF PETERSHAM—ADDITIONAL BY-LAW.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 19th October, 1886.

BOROUGH OF PETERSHAM.—ADDITIONAL BY-LAW.

THE following Additional By-law, made by the Council of the Borough of Petersham, relating to loitering upon the footways or other public places within the Municipality, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the "Municipalities Act of 1867."

GEORGE R. DIBBS.

BOROUGH OF PETERSHAM.—ADDITIONAL BY-LAW.

ALL persons standing or loitering upon any of the footways or other public places within the Borough of Petersham, to the inconvenience or annoyance of passers-by or residents, or in any way interrupting the traffic, and who shall not discontinue to do so on being so requested by any officer of the Council or any police officer, shall upon conviction forfeit and pay a penalty not exceeding £5 and not less than five shillings (5s.)

Passed by the Council of the Borough of Petersham, on the tenth day of March, 1885.

(L.S.) WM. LOVEL DAVIS,
Mayor.

AUBREY MOWLE, Council Clerk.

[3d.] 1035—

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF QUEANBEYAN—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 12th November, 1885.

BOROUGH OF QUEANBEYAN.—BY-LAWS.

THE following By-laws, made by the Council of the Borough of Queanbeyan, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the "Municipalities Act of 1867."

P. A. JENNINGS.

BY-LAWS to regulate the proceedings of the Municipal Council of Queanbeyan, the collection of rates, and the general good rule and government of the Municipality.

THAT the following be and are hereby confirmed as the By-laws of the Borough Council of Queanbeyan :—

Meetings of Council.

Ordinary meetings.

1. Unless otherwise ordered, the Council shall meet for the despatch of business on every alternate Thursday, at the hour of 7·30 p.m., from the 1st March to the 1st September, and from the 1st September to the 1st March at the hour of 8·30 p.m., unless such day shall happen to be a public holiday, in which case the meeting shall be held on such day as the Mayor may appoint.

Chairman—election of, in absence of Mayor.

2. If the Mayor be absent fifteen minutes after the hour appointed for any meeting, the Aldermen present shall at once proceed to elect a Chairman : Provided always that, if the Mayor shall afterwards attend, such Alderman shall leave the chair which shall be taken by the Mayor. If a quorum be not present within thirty minutes of the time appointed, such meeting shall lapse, and the names of those members present shall be noted in the minute-book.

Order of procedure.

3. The following shall be the course of procedure at such meetings, viz. :—

(i) The reading and confirmation of minutes of the previous meeting, no discussion being permitted on such minutes, except as to their accuracy.

(ii) Reading of correspondence, and dealing with same.

(iii) Reports of Committees, and, when practicable, dealing with same.

(iv) Presenting and reading petitions.

(v) Orders of the day as specified on business paper.

(vi) Adjourned motions, and motions of which notice has been given, in the order in which received.

(vii) Notices of motion, which must be numbered as received by Council Clerk.

(viii) Such other business as may lawfully be brought before the Council : Provided that it shall be competent for the Council to take any particular matter out of the regular order in which it stands on the business paper, and in like manner to order that any particular motion or matter of business shall have precedence at a future meeting.

Aldermen to stand whilst speaking.

4. Except in committee every Alderman shall stand whilst speaking, and shall address the chair.

Pre-audience—how determined.

5. If two Aldermen shall rise to speak at same time the Mayor or Chairman shall decide which Alderman shall have pre-audience.

Limit to speaking.

6. No Alderman shall speak twice on the same question, unless in committee or in explanation : Provided always that any Alderman having previously spoken on the original question shall be entitled to speak once on each amendment, and that the mover of the original question shall have the right of final reply. No Alderman shall speak for a longer period than ten minutes without consent of Council.

No digression.

7. No Alderman shall digress from the subject under discussion.

Aldermen making offensive remarks to apologise.

8. No Alderman shall make any offensive personal remarks upon, nor impute any improper motives to, any other Alderman; and any Alderman so offending shall, immediately upon being required thereto by the Mayor or Chairman, withdraw such offensive expressions, and retract such imputations of motives, and make an apology satisfactory to the Council. Any Alderman refusing so to apologise, and to withdraw such offensive expressions or imputations, the same shall be recorded in the minutes as evidence in court, and he shall, on conviction, be liable to a penalty not exceeding ten pounds.

Mayor to preserve order.

9. The Mayor or Chairman shall preserve order, and may at any time call to order any Alderman whom he may deem to be out of order.

Calls to points of order.

10. Any Alderman may call the attention of the Mayor or Chairman to any Alderman being out of order, and to any point of order.

Consideration of points of order.

11. Every point of order shall be taken into consideration immediately upon its rising, and the decision of the Mayor or Chairman shall be final and conclusive, except as hereinafter provided.

Appeal from decision of chair.

12. Any Alderman who is dissatisfied with the decision of the Mayor or Chairman on any such question of order or of practice may, by motion on notice, respectfully worded, invite the Council to lay down a different rule or principle for the determination of any similar question of order or of practice which may thereafter arise. Any rule or principle thus laid down shall be binding upon all parties unless and until it be rescinded, but shall have no retrospective operation.

Questions, how put.

13. All questions shall be put through the Mayor or Chairman, and no motion shall be discussed unless and until it be seconded.

Notices of motion to be in writing.

14. Every motion, notice of which has been given, shall be in writing, and signed by the mover. No motion seconded shall be withdrawn without leave of the Council.

Casting vote.

15. The Mayor or Chairman shall have an ordinary and a casting vote, and may take part in all discussions and proceedings of the Council or committees thereof, but shall not move or second any motion.

Discussion of amendments.

16. When a motion shall have been moved and seconded, any Alderman shall be at liberty to move an amendment thereon, but no such amendment shall be discussed unless and until it be seconded.

Second amendments, when permissible

17. No second or subsequent amendment shall be taken into consideration until the previous amendment shall have been disposed of.

When an amendment becomes the question.

18. If an amendment be carried, the question as thereby amended shall become the question before the meeting, whereupon any other amendment may be moved.

Mode of putting questions.

19. The Mayor shall put all questions first in the affirmative, and then in the negative (provided that when an amendment is moved to any motion the amendment shall be put first), and may do so as often as may be necessary to enable him to determine the sense of the Council thereon, and thereupon he shall declare his decision, which shall be final, unless a division be called for.

Voting how done.

20. Voting shall be by show of hands, and it shall be competent for any Alderman to call for a division of the Council; and no Alderman shall leave his seat or place until the names of the Aldermen and how voting shall have been taken down by the Council Clerk or person officiating for him.

Notices of motion to rescind.

21. No motion the effect of which, if carried, would be to rescind any motion which has already been resolved on by the Council, shall be entered on the business paper unless a call of the whole Council has been duly granted and made for that purpose.

Question to be read by Council Clerk.

22. Any Alderman may require the question or matter under discussion to be read once for his information and, upon such request the question or matter under discussion shall be read by the Council Clerk.

Divisions to be minuted.

23. All divisions of the Council shall be inserted in the minutes of the proceedings.

Debates may be adjourned.

24. Debates may be adjourned to a later hour on same day, or to another day.

Pre-audience on resumption of debate.

25. The Alderman upon whose motion any debate shall be adjourned shall be entitled to pre-audience on the resumption of the debate.

Motions of adjournment.

26. Any motion for adjournment of the Council, if seconded, shall be immediately put without discussion; but, if such motion be negatived, it shall not be competent for any Alderman to make a similar motion until thirty minutes shall have elapsed.

Motions under notice when not to be proceeded with.

27. No motion of which notice shall have been entered on the business paper shall be proceeded with in the absence of the Alderman by whom such notice shall have been given, unless by some other Alderman producing an authority for that purpose from such first-named Alderman.

Order of special meetings.

28. At special meetings of the Council, the business (after the minutes shall have been read and verified, which shall be done in the same manner as at ordinary meetings) shall be taken in such order as the Mayor or Aldermen at whose instance the special meeting shall have been called may have directed.

Orders of the day.

Orders of the day defined.

29. The orders of the day shall consist of any matters other than motions on notice which the Council shall at any previous meeting thereof have directed to be taken into consideration, or which the Mayor or Chairman or any Committee of the Council shall have directed to be entered upon the business paper for consideration.

Who to move.

30. The Alderman who has the usual charge of, or who has previously moved in reference to, the particular business to which any such order of the day relates, shall be the person called upon to move: Provided that the Mayor or Chairman for the time being may, as to any order of the day entered by his direction, arrange with and call upon any Alderman to move the same.

Petitions.

Contents of petition to be known and stated before presentation.

31. It shall be incumbent on every Alderman presenting a petition to acquaint himself with the contents thereof, and to ascertain that it does not contain language disrespectful to the Council. The nature and prayer of such petition shall be stated to the Council by the Alderman presenting the same, and all such petitions shall be received only as the petitions of the parties signing the same.

Petitions—order of proceeding with referred to.

32. On the presentation of any petition the only question that can be entertained by the Council shall be that the petition shall be received, or that it be referred to a committee: Provided that any petition which has been received may be taken into consideration upon notice of motion in the usual manner.

Protests against resolutions or votes.

33. Any member of the Council may protest against any resolution or vote of the Council. Notice of intention to protest must be given at the meeting when such resolution or vote is come to, and the protest itself in writing must be handed to the Council Clerk not later than three days after such notice. The Council Clerk shall enter every such protest in the minute-book; but if, in the opinion of the Council, such protest be inconsistent with truth, or disrespectfully worded, it may, by resolution of the Council, be ordered to be expunged.

Call of Council.

34. A call of the whole Council may be ordered by any resolution of which due notice shall have been given for the consideration of any motion or matter of business before such Council.

Exclusion of strangers.

35. Upon the opening of any tender, or during the appointment of any officer, strangers shall be ordered to withdraw.

Letters—who to open.

36. All letters shall be opened by the Mayor or Chairman, who shall acquaint himself with their contents before reading them to the Council.

Tenders to be advertised.

37. Whenever it is determined by the Council to carry out any work by contract, public notice calling for tenders shall be given by advertisement in the local papers, and by a notice posted on a board outside the Council Chambers for one week at least.

Committees of the Whole.

38. On resolution, the Council may resolve itself into a committee of the whole for the consideration of any question brought regularly before it. In Committee of the whole all the rules herein laid down for the conduct of the ordinary business of the Council shall be observed, except the rules limiting the number of times of speaking, and requiring the Aldermen to stand whilst speaking. All reports of Committees of the whole shall be made by the Chairman *viva voce*, and shall be recorded in brief in the minute-book, but no such report shall, by reason of such entry, be considered as adopted by the Council.

Standing and Special Committees.

Special Committees.

39. The appointment of Special Committees shall continue until the specific duty for which they have been appointed shall have been discharged: Provided that such Committees may at any time be dissolved by vote of the Council.

Standing Committees.

40. Besides such Special Committees as shall from time to time be appointed there shall be three Standing Committees elected annually, viz., By-laws Committee, Finance Committee, and a Works Committee, each of which Standing Committees shall consist of not less than three Aldermen, and shall include an Alderman from each Ward, should the Borough be so divided.

By-laws Committee—their duties.

41. The By-laws Committee shall prepare, for consideration of the Council, drafts of all By-laws which may be required for the good government of the Municipality, and shall supervise the administration of such By-laws and adopt measures for their enforcement.

Finance Committee.

42. The Finance Committee shall deliberate and report upon all questions affecting the finance of the Municipality which shall be committed to it by resolution of the Council; it shall also examine the accounts and watch over the financial administration of the Municipality.

Duties of Finance Committee.

43. It shall also be the duty of the Finance Committee to inspect all books of accounts, records, statements, and memoranda from time to time, at least once in each three months, to ascertain that the same are properly kept, and to report at once to the Council any inaccuracy, or appearance thereof, which they may have discovered in the keeping of the same.

Accounts to be examined by.

44. No money shall be paid by the Council until the account for the same shall have been examined and reported upon by the Finance Committee.

Works Committee.

45. The Works Committee shall inspect and direct all public works in progress within the Municipality, and may call the attention of the Council thereto by report at all times, and to the state of any public street, lane, or thoroughfare, and to any other improvements which may be required within the Municipality, and shall consider and report upon all questions relating to improvements that they may think necessary, or that may be committed to them by resolution of the Council.

Duties of Chairman of Committees.

46. Each Chairman of a Standing Committee shall keep a record of the proceedings of such Committee in a book to be used solely for that purpose; such book shall be the property of the Council, and shall be produced to the Council when required.

Standing Committees—when appointed.

47. The Standing Committees shall be appointed within thirty-one days after the commencement of each municipal year.

Committees may take evidence.

48. Every Committee may take evidence upon any question or questions of fact, and a minute of such evidence shall in all cases be appended to their report.

Reports of Committees to be in writing, &c.

49. The report of every Committee shall be in writing, on foolscap, with one-third margin, and shall be signed by the Chairman of such Committee.

Council Clerk to call meetings of Committee.

50. The Chairman of any Committee may direct the Council Clerk to call meetings of such Committee at such time and place as he may deem expedient.

Protection of Funds and Records.

Expense of proposed works to be ascertained.

51. Except in cases of emergency, as hereinafter specially provided for, no work affecting the funds of the Municipality shall be undertaken until the probable expense thereof shall have been first ascertained by the Council.

Payment to be duly authorised.

52. No payments out of the funds of the Corporation shall be made but such as are authorised by the Council, and all payments shall be made on a warrant signed by the Mayor or Chairman, and countersigned by the Council Clerk.

Works of emergency.

53. For works of emergency requiring immediate attention, and for necessary current expenses between the meetings of Council, a warrant may be issued by the Mayor, with the assent of any two Aldermen, authorising the expenditure of any sum or sums not exceeding in all twenty pounds (£20): Provided always that the particulars of such expenditure be reported to the Council at their next meeting, and that no outlay involving a disobedience or evasion of any order or resolution of such Council shall on any pretence be thus authorised.

Custody of records, &c.

54. All stationery, books, records, papers, maps, agreements, plans, deeds, charters, muniments of or relating to the municipality, shall be kept at the Council Chambers, and shall be in charge of the Council Clerk, who shall be responsible for the safe custody of the same.

Records to be filed.

55. All such records other than the minute-book and other books, and other than electoral rolls and other records relating to elections, shall be numbered and filed in due order, and shall be duly registered by the Council Clerk in a book to be kept by him for that purpose. Upon the face of every such record to which there is any reference in the minute-book there shall be a note of the page wherein it is so referred to.

Books, papers, or records not to be exposed or shown.

56. No member or officer of the Council shall show, lay open, or expose any of the books, papers, or records of the Council to any person not being a member of such Council, without leave had and obtained of such Council, except as provided by law, under a penalty not exceeding five pounds.

Books, &c., not to be removed without Mayor's leave.

57. No person shall remove from the Council Chambers any such book, record, or paper of the Council without leave for such removal having been first obtained from such Council; and any person offending against this by-law shall for every such offence be liable to a fine not less than one pound and not exceeding ten pounds: Provided always that leave for the temporary removal of books or other records for the purpose of posting up entries, preparing returns, or performing any other necessary duty, may be granted by the Mayor to the Council Clerk or other officer of the Council. Such leave shall be in writing, and shall specify the books for the removal of which leave is granted: Provided also that nothing herein contained shall be held to affect the further liability of any person so removing any book, record, or paper as aforesaid, and shall not have returned the same, to prosecution for stealing the same, or to an action at law for detention of the same.

Books, &c., not to be defaced or altered.

58. Any person wilfully destroying, defacing, or altering any book or books, record or records of the Council, shall for every such offence be liable to a penalty not exceeding fifty pounds.

Custody of Seal.

59. The Mayor shall have the custody of the Corporation Seal, and shall affix it to all documents creating an obligation on the Council, in the presence of the Council Clerk, who shall duly verify the impression of the same by his signature. In every case such document shall be signed by the Mayor.

Impression of Seal not to be made.

60. No member or officer of the Council shall take any impression of the Corporation Seal.

Appointment to permanent offices how made.

61. No appointment to a permanent office under the Council shall be made until the salary for such office be fixed, and advertisements shall have been inserted in the local papers stating the nature of the office and inviting applications to be sent thereon: Provided that the Council may appoint without advertisement any salaried officer of the Council to any other permanent office to which no further salary is attached, or to any office requiring only occasional attention, and when payment for such duty is to be proportionate only to the extent of duties performed; and that the Council may employ from time to time, as may be found necessary, workmen or labourers on the public works of the Municipality.

Duties of officers to be defined.

62. The duties of all officers and servants of the Corporation shall be defined by regulations made from time to time by the Council.

Mayor to have supervision.

63. The Mayor shall exercise a general supervision over all officers and servants of the Corporation, who shall pay due deference to his instructions and directions, whether in writing or otherwise, in all cases where such instructions and directions have reference to the performance of any matter or thing within the sphere of such officer's or servant's duties under the Corporation.

Complaints against officers.

64. All complaints against officers and servants of the Municipality must be in writing, and signed by the person or persons complaining, and shall be addressed to the Mayor, who shall have power at once to investigate them. All explanations by the person or persons complained against shall be in writing, and placed before the Mayor, who upon investigating the case shall state in writing his opinion as to what order should be made thereon, and such complaints and explanations, with the Mayor's opinion, shall be laid before the Council at its first meeting and be dealt with forthwith.

Determination of engagement of officers.

65. The engagement of any officer may be determined at any time by a vote of the majority of the whole Council: Provided that one month's notice shall be given to every such officer whose services are to be so dispensed with, and that any officer may resign his appointment by giving to the Council one month's notice in writing of his desire and intention to do so: And provided further, that nothing herein contained shall be taken or construed in any way to affect the powers of suspending officers and of dismissing men for misconduct, vested in the Council by the 152nd section of the Municipalities Act of 1867, 31 Vic. No. 12.

Bonds, where deposited.

66. All bonds given by the officers or servants of the Corporation shall be deposited with the attorney or bankers of the Council.

Sureties to be qualified and approved.

67. In all cases where security shall be required by the Municipalities Act of 1867, the sureties offered shall be approved of by the Council; and it shall not be competent for the Council to accept as surety any of its members, or any person holding office under the Council.

Moneys to be banked.

68. All moneys received by any officer of the Council shall immediately, or within twenty-four hours after the receipt of the money, when possible, be paid by such officer to the Treasurer, together with a statement in writing setting forth the particulars thereof; on receipt of which the Treasurer shall sign a voucher, acknowledging the receipt of such payment, and shall pay the amount thereof into the Bank within twenty-four hours after such receipt thereof.

Rates.

Rates to be collected half-yearly.

69. All rates levied or imposed by the Council under the 164th section of the Municipalities Act of 1867, 31 Vic. No. 12, or under any other section thereof, and for the purposes mentioned in the said section or sections, shall be collected half-yearly; and every such instalment shall be held due and payable on such days as the Council may by resolution appoint at the time of imposing such rates; and all such rates shall be payable at the office of the Council Clerk during office hours, that is to say, between the hours of 11 a.m. and 3 p.m. of every Monday, Thursday, and Saturday, in each week, or upon such other days as the Council may from time to time appoint by resolution.

Change of occupiers—notice to be given of.

70. If the owner, tenant, or occupier of any property within the Municipality, for which he or she is assessed, shall give up the possession of such property, he or she shall, within one day from the date of giving up possession thereof, deliver to the Council Clerk a notice in writing showing and setting forth the name and address in full of the person to whom possession of such property has been given.

Subdivisions—notice required in cases of.

71. If any property shall be subdivided in the interval between one assessment and another, and sold or let to two or more persons, the tenant or owner who previously occupied the whole of such property shall, within seven days from the time of such subdivision taking place, deliver to the Council Clerk a notice in writing setting forth in full the area, rent, and names in full of the owners or occupiers of such subdivision; and any owner, occupier, or tenant failing or neglecting to give such notice as is herein required, shall, on conviction, be liable to a fine not exceeding two pounds.

Defaulting ratepayers.

72. It shall be the duty of the Council Clerk to furnish to the Mayor a list of the names of all persons whose rates are unpaid at the expiration of the period fixed for the payment thereof; and it shall be the duty of the Mayor to issue distress warrants against all such persons, and to cause such warrants to be enforced, or to cause such defaulter to be sued for the amount of such rates in a court of competent jurisdiction.

Bailiff to find sureties.

73. A Bailiff for the purpose of enforcement of rates shall be appointed by resolution of the Council upon notice, and shall be liable to removal from office in the same manner. He shall find two sureties, who shall be approved of by the Mayor, and who shall enter into a bond of £25 (twenty-five pounds) each on his behalf that he shall well and truly perform all the duties imposed upon him as such Bailiff.

Duties of Bailiff.

74. It shall be the duty of the Bailiff to make all levies by distress for the recovery of rates, to conduct all sales of goods distrained upon, and to receive and forthwith account for all moneys paid over to him, or arising from such sales, and to pay into the hands of the Council Clerk, within forty-eight hours after the receipt thereof, the amount or amounts which shall have been recovered in discharge of such rate or rates for which distress has been enforced as aforesaid.

Sale under distraint

75. If the amount for which any distress shall have been made be not discharged, with all costs, on the expiration of five days after such distress, the Bailiff shall sell the goods so distrained upon, or a sufficient portion thereof, by public auction (due notice of such sale having been previously advertised in local papers), on the premises, or such other convenient place within the Borough as he may think it best in the interest of the defaulter or owner to remove them to for such purpose; and immediately after such sale shall pay over to the late owner, or anyone authorized in his or her behalf, or should there be no such person, to the Council Clerk, any surplus proceeds of such sale as may remain in his hands after deducting the amount due for rates, and all necessary expenses authorized by the Council in distraining and selling the said goods.

Warrants of distraint.

76. All levies and distresses shall be made under warrant, in the form of Schedule A (*vide* Appendix), under the hand of the Mayor, or alderman who may for the time being be duly authorised to perform the duties of that officer.

Inventory to be made of goods distrained.

77. At the time of making a distress the Bailiff shall make out a written inventory in the form of Schedule B (*vide* Appendix), which inventory shall be delivered to the occupant of the land or premises, or the owner of the goods so distrained, or to some person on his or her behalf, resident at the place where the distress shall be made; and in case there shall not be found any person with whom such inventory can be left or delivered, then the same may and shall be posted in or upon some conspicuous place on the land or premises, and a copy of such inventory shall be delivered without charge by the said Bailiff to the person distrained upon, or should there be no such person, to the Council Clerk, at any time within four weeks after distress.

Distrained goods to be impounded.

78. The Bailiff, on making distraint, may impound or otherwise secure the property seized, of what nature or kind soever it may be, in or upon such place or places, or in or upon such part of the land or premises chargeable with rates, as he shall consider best fitted for the purpose; and it shall be lawful for any person whatever, after the expiration of the five days aforesaid, to come and go to and from such place or part of the aforesaid land or premises, where such goods or property may be impounded or secured as aforesaid, in order to view, buy, and carry off or remove the same on account of the purchaser or purchasers.

Owner may direct order of sale.

79. The owner of the property distrained upon may, at his or her option, direct the order in which such property shall be sold, and the Bailiff shall thereupon dispose of such property in the order as directed by the owner thereof.

Scale of charges.

80. There shall be payable to the Bailiff, for the uses of the Council, the following costs and charges, namely:—

	s.	d.
For every distress warrant	2	6
For levying distress and making inventory ...	5	0
For possession each day or portion thereof.....	3	6
All charges incurred for advertising, and 5 per cent. on net proceeds of goods.		

Prevention and Extinguishing of Fires.

Inflammable fences, &c.,

81. For the better prevention of fires it is provided that no person shall erect any fence of brushwood, bushes, or other such inflammable material, or any stack of wheat, hay, grain, or other inflammable material or contents within fifty yards of any building in any portion of the town, under a penalty, upon conviction, not exceeding five pounds, to be recovered in a summary way. And if the said stacks or fences be not removed within such period after conviction as the Council may order, the person offending shall be liable to further prosecution as in the first instance.

Inflammable buildings.

82. No person shall erect any building of bark or roofed with that material or with calico within the populous part of the town, except by express permission of the Council, and then for a temporary purpose only. Any person so offending shall, on conviction, be liable to a penalty not exceeding ten pounds, to be recovered in a summary way; and shall be bound to remove the aforesaid building within such period as the Council may determine.

Storage of combustibles, &c.

83. Any person who shall knowingly allow fire, gunpowder, or any combustible or inflammable material, matter, or thing whatsoever, to be kindled, stored, or placed in, about, or upon any portion of his premises, or premises over which he has control, in such a manner as to endanger adjoining buildings or the public safety, shall upon conviction forfeit a penalty not exceeding five pounds, and shall be further liable to a like penalty for every forty-eight hours during which he shall allow the said fire, gunpowder, or combustible matter to remain in or about his said premises after the first conviction.

Wilfully setting fire to inflammable material.

84. Any person who shall wilfully set fire to any grass, stubble, or other inflammable material in the open air within the Municipality, without giving at least twenty-four hours' notice of his intention to do so to the owners or occupiers of the adjoining land or premises, shall be liable, upon conviction, to pay a penalty of not more than ten pounds.

Payments and premiums for delivery of water in cases of fire.

85. There shall be paid out of the funds of the Municipality to the owner of every licensed or other water-cart who shall have attended with water at the place of any fire in any building, premises, or other property within the Municipality, and delivered the same as required, such reasonable compensation as the Council shall have appointed in that behalf, and also to such owner of such cart as shall have first in order attended with a load or loads of water at the place of such fire, such further sum by way of reward as the Council may have determined.

Water-carts to be licensed.

86. The Council shall from time to time license to ply within the Municipality such carts for the carrying and sale of water as shall upon inspection be found fit for that purpose. Every such cart or vessel contained therein for the holding of water for sale shall be capable of containing not less than fifty gallons, and shall have the name of the owner, and the words "licensed water-cart," painted on such cart in legible letters.

Applications for licenses.

87. Every such license shall be issued on the written application of the owner thereof, in which application shall be set forth the name and surname and place of abode of the applicant; and for every such license there shall be paid to the Council at the rate of two shillings and sixpence per quarter, payable on the first day of January, April, July, and October, in each year, in advance.

Penalty for unauthorised sale of water.

88. Any person hawking or carrying water for sale or hire, otherwise than in a licensed water-cart as aforesaid, shall, upon conviction, be liable to a penalty not exceeding two pounds.

Water—where to be obtained.

89. The driver of every licensed water-cart shall fill his cart only at such place or places as may be appointed by the Council, and shall sell full casks of not less than fifty gallons. Every person offending against this section shall be liable to a penalty not exceeding five pounds.

Scale of charges for water.

90. The charges for delivering water shall be as follow:—Not exceeding a quarter of a mile, 6d.; for every quarter of a mile or fraction of a quarter of a mile, 3d.—for every load of not less than fifty gallons.

Rates may be remitted.

91. In the event of any premises being wholly or partially destroyed by fire or other accident, the Council shall have power to accept an equitable proportion of or to remit the assessed rates of such premises for the remainder of any municipal year.

By-laws enforcing public decency.

Bathing within prohibited hours.

92. Any person who shall bathe near to or within view of any inhabited house, street, road, or place of public resort within the Municipality, between the hours of six o'clock in the morning and eight o'clock in the evening, and not being provided with and wearing a proper and decent bathing-dress when so bathing as aforesaid, shall on conviction, forfeit and pay a sum not exceeding one pound for every such offence.

Indecent exposure.

93. Any individual who shall offend against decency by the exposure of his or her person in any street or public place within the said Municipality, or in view thereof, shall, on conviction, forfeit and pay for every such offence a sum not exceeding five pounds.

By-laws for the care and management of the public roads, streets, thoroughfares, &c.

Plans and sections of cuttings and levels.

94. In any street or road, where it may be deemed necessary to cut or fill up to a greater depth than three feet, the Council shall cause a plan and section, showing the proposed cuttings and fillings, to be exhibited at the Council Chambers for seven days, for the information and inspection of ratepayers, and notify the same in the local newspapers; and no objections thereto shall be entertained by the Council, unless made within twenty-one days after such notice shall have been given.

Encroachments.

95. No person shall encroach beyond the building-line in any street or lane, by the erection of houses, verandahs, door-steps, fences, or any other obstructions whatsoever, without consent of the Council.

Damage by vehicles and otherwise

96. No driver, carter, or other person shall wilfully or negligently do or suffer, or cause to be done, any damage or injury to the culverts, kerbstones, gutters, or pathways of any street or roadway, but shall, upon conviction, pay a penalty not exceeding two pounds over and above the damage occasioned thereby.

Lines, cords, &c. across thoroughfares.

97. Any person who shall place any line, cord, or pole across any street, lane, or right-of-way, or hang or place clothes thereon, to the danger or annoyance of any person or persons, shall be liable to a penalty not exceeding one pound.

Animals on the footwalks.

98. Any person whosoever who shall wilfully drive, lead, or ride any horse or cattle, or any other animal, along any pathway (except in crossing such pathway to or from any premises adjoining the same), or shall permit any horse or cattle to stand upon any pathway, or any part thereof, within the Municipality, shall forfeit and pay a penalty not exceeding two pounds.

Injuring or destroying roads or footwalks.

99. No person shall be allowed to alter, cut up, or destroy the pathways or roads, or to remove stone, loam, sand, gravel, or any other substance whatsoever, from any of the roads, grounds, or streets of the Municipality without the authority of the Council. Any person so offending shall be liable to a fine not exceeding five pounds.

Obstructing roads.—Water-holes and excavations.—Lights to be provided.

100. No person shall be allowed to obstruct any road, street, or public thoroughfare within the Municipality, by building materials, drays, carts, or anything calculated to obstruct and hinder free passage, without the sanction of the Council in writing; and no person shall be allowed to leave waterholes, or excavations for cellars or other purposes, unfenced, or in such a manner as to be dangerous to passers-by; and at all places where buildings are being carried on, or where any obstruction to the danger of passers-by exists, the person causing such obstructions shall be required to provide lights on either side, and keep the same lighted from sunset to sunrise. Any person so offending against this by-law shall be liable to a penalty not exceeding five pounds.

Regulations as to removal of night-soil, &c.

101. If any person or persons shall drive, or cause to be driven, any cart or other vehicle with any night-soil, or shall take away or remove any noisome matter in any cart or other vehicle, through or in any of the streets, roads, or public places within the said Municipality, between the hours of five o'clock in the morning and ten at night; or shall fill any cart or other carriage so as wilfully to turn over or cast any night-soil, or other offensive matter, in or upon, or near, any of the said streets or public places; or shall deposit or cast out the night-soil hereinbefore described, from such carts as aforesaid, nearer to any road, street, or dwelling-place than shall be directed by the said Council—he shall for every such offence

forfeit and pay a penalty of not less than one pound and not more than ten pounds. And in case the person so offending cannot be apprehended, then the owner of such cart or other vehicle, in which such night-soil or offensive matter shall be put or placed, and also the employer of the person offending, shall be liable to pay and forfeit such penalty as aforesaid.

Vehicles to be under due control of drivers and not to obstruct free passage

102. If the driver of any waggon, dray, or vehicle of any kind, shall ride upon the same in any street, road, or thoroughfare, not have some person on foot to guide the animals drawing the same (such vehicles as are drawn by horses driven or guided by reins only excepted), or if the driver of any vehicle whatsoever shall wilfully be at such a distance from such vehicle, or in such a situation whilst it shall be passing upon such street, road, or thoroughfare that he cannot have the direction or government of the horse or horses or cattle drawing the same, or if the driver of any waggon, cart, dray, coach, carriage, or other vehicle, shall not drive on the left or near side of any such road, street, or thoroughfare; or if any person shall in any manner wilfully prevent any other person or persons from passing him or her on any vehicle under his or her care upon such street, road, or thoroughfare, or by negligence or misbehaviour prevent, hinder, or interrupt, the free passage of any person or vehicle or carriage in or upon the same, every such driver or person so offending shall forfeit and pay for every such offence any sum not exceeding forty shillings.

Making drains, removing soil, &c., or damaging streets, &c., without leave.

103. Any person who shall form, dig, or open any drain or sewer in any part of the lanes, roads, streets, or thoroughfares within the Municipality; or shall move, or cause to be moved, any turf, clay, sand, soil, gravel, stone, or other material, without leave first had and obtained from the Council, or persons having lawful charge of such lanes, roads, streets, or thoroughfares respectively; or who shall wantonly break up or otherwise damage any part of the said lanes, roads, streets, or thoroughfares, shall, on conviction, forfeit and pay for every such offence a penalty not exceeding five pounds.

Furious riding or driving.

104. Any person who shall ride or drive through any lane, road, street, or public place, negligently, carelessly, or furiously, to the common danger of the public, or any person who, not being a duly qualified medical man, nor a police officer in the execution of his duty, shall ride or drive around a street corner at a faster pace than a walk, shall, upon conviction, pay a sum not exceeding five pounds.

Damaging marks, notice-boards, &c.

105. Any person pulling down or pulling up, destroying, or injuring any alignment or other boundary marks or stones, notice-boards, public notices, or other erection on any reserve, public place, or road, without the authority of the Council, shall forfeit and pay an amount not exceeding ten pounds.

Offensive premises.

106. Upon representation by any respectable householder that the house, premises, yard, closet, or drains of the adjoining premises, are a nuisance or offensive, the Mayor or any two Aldermen shall cause an inspection to be made of the premises complained of; and if any such premises shall be found to be a nuisance, or otherwise offensive, notice in writing shall be given to the proprietors, or resident of such premises, that if within fourteen days after such notice the nuisance shall not be removed, the proprietor or tenant of the aforesaid premises shall be liable to a penalty not exceeding five pounds.

Waterfowl not to frequent rivers, &c.

107. No person being the owner or person in charge of such birds shall permit any ducks, geese, or other water-fowl, to swim upon or frequent any public watercourse, sewer, waterhole, tank, river, creek, or canal, within the Municipality, without permission, to be obtained annually from the Council. Any such person offending against this by-law shall forfeit and pay a sum not exceeding two pounds, and a further sum of five shillings for every day during which the offence may continue after conviction.

Pigeons to be destroyed.

108. No person being the owner or person in charge of such birds shall permit any pigeon or pigeons to be at large within the Municipality and any person duly authorized by the Council may destroy such birds without being responsible to any person claiming ownership in them.

Placards, &c., not to be affixed.

109. It shall not be lawful for any person to paste or otherwise affix any placard or other paper upon any wall, fence, house, or building, or to deface any such wall, fence, house, or building by chalk, paint, or in any other manner, unless with the consent of the owner thereof. Any person who shall be guilty of any such offence shall forfeit and pay a sum not exceeding forty shillings.

Houses of ill-fame to be suppressed.

110. Upon representation by any two respectable householders that the house or premises adjacent is one of ill-fame, it shall be lawful for the Mayor or any two Aldermen to cause the resident of such house to furnish the Council a list of the names, sex, birthplace, and occupation of all the inmates of the said house, and upon non-compliance with the request, or if, upon consideration, the Mayor or other two Aldermen still consider the house to be one of ill-fame, the Mayor shall cause a notice in writing to be served on such householder or resident to discontinue and abate the said house of ill-fame within forty-eight hours after the receipt of such notice, otherwise to be liable to a penalty not exceeding one pound for every day or part of a day which such house of ill-fame shall remain unabated within the Municipality.

Casting filth, &c., into public water.

111. Any person who shall cast any filth, rubbish, or any dead animal, or any animal with intent of drowning, into any public watercourse, sewer, waterhole, or river, or creek, or canal, or shall obstruct or direct from its channel any such sewer, canal, or watercourse, shall forfeit and pay a sum not exceeding five pounds, and shall pay the costs of removing such filth or obstructions, or of restoring such watercourse or canal to its proper channel, at a cost not exceeding fifty pounds in the whole.

Washing offensive matter in river, &c.

112. Any person who shall wash or cause to be washed any wool, hides, skins, or any other offensive matter, in any river, creek, or watercourse within the Municipality, shall forfeit and pay a penalty not exceeding ten pounds: Provided always that the Council may grant permission for such purposes from year to year, where it may appear to them unobjectionable.

Bathing within prohibited places.

113. No person shall be permitted to bathe in any portion of the Queanbeyan River within the Municipality except below the cemeteries, under a penalty not exceeding two pounds.

Animals not to stray or be tethered.

114. It shall not be lawful for any person whomsoever to suffer any kind of swine, or any horse, ass, mule, sheep, goat, or cattle belonging to him, or under his or her charge, to stray, to go about, or to be tethered or depastured in any lane or street within the populous portion of the said Municipality; and any person who shall so offend shall forfeit and pay in respect of every such animal a sum not less than two shillings and sixpence nor more than two pounds. Provided that the Council, or any officer or officers appointed by them, may impound any swine, horse, ass, mule, sheep, goat, or cattle found straying or going about, or depasturing in any lane or street within the Municipality.

Drawing timber, &c.

115. If any person shall haul or draw, or cause to be hauled or drawn, upon any part of the streets, roads, or public places, any timber, stone, or other thing otherwise than upon wheeled carriages, or shall suffer any timber, stone, or other thing which shall be carried principally, or in part, upon wheeled carriages, to drag or trail upon any part of such street or public place, to the injury thereof, every such person so offending shall forfeit and pay for every such offence a sum not less than five shillings nor more than two pounds, over and above the damages occasioned thereby; and it shall be lawful for any constable or any other person to lay an information against any person whom he shall find in the act of committing any such offence.

Regulating the driving of stock.

116. No horses, cattle, sheep, goats, swine, mules, or other stock, shall be driven through any populous part of the borough between the hours of 9 a.m. and 11 p.m.: Provided that in flood time, when the ordinary crossings are impassable, any sheep or other stock that may be driven without endangering life and limb of the public, may, upon the written authority of the Mayor or any Alderman, be permitted to pass over any bridges or culverts, and over any streets through which it may be necessary to pass in order to obtain access to and from such bridges and culverts. Any person violating this By-law shall be liable to a penalty not exceeding five pounds.

Polluting water or casting offensive matter on roads, &c.

117. If any person shall in any street, road, watercourse, public well, or tank, throw, cast, or lay, or shall permit or suffer to be thrown, cast, or laid, or to remain, any ashes, rubbish, offal, dung, soil, dead animal, blood, or other filth, or annoyance, or any matter or thing in or upon the carriageway or footway of any street or road, or shall kill, slaughter, dress, scald, or cut up any beast, swine, calf, sheep, lamb, or other cattle in or so near to any of the streets or thoroughfares as that any blood or filth shall run or flow upon or over, or to be on any such carriage or footway, shall forfeit and pay a sum not exceeding forty shillings.

Driving with reins and lights.

118. Any person who shall drive any cart or carriage or other vehicle through streets without reins, or after dark, any vehicle driven at a faster pace than a walk, without carrying lights on any nights except the three nearest the full moon, shall be liable to a penalty not exceeding two pounds.

Filthy premises.

119. If, upon the certificate of any one or more duly qualified medical practitioner or practitioners, it shall appear to the Council that any premises or part thereof within the limits of the Borough is in such a filthy or unwholesome state that the health of any person is or may be liable to be affected or endangered thereby, or that the whitewashing, cleansing, or purifying of any house or premises, or any part thereof, would tend to prevent or check infections or contagions, the said Council shall give notice in writing to the owner or occupier of such premises to whitewash, cleanse, or purify the same as the case may require; and if the said owner or occupier, to whom notice is so given, shall fail to comply therewith within such time as shall be specified on the said notice, he shall be liable to a penalty not exceeding ten shillings for every day during which he continues to make default. And the said Council shall, if they think fit, cause such premises to be whitewashed, cleansed, or purified, and for such purpose the officers, servants, and workmen of the said Council shall have power to enter the same, and the expense incurred by the Council shall be paid by the owner or occupier.

Officers may enter on premises.

120. It shall be lawful for any officer or officers when appointed and instructed by the Council from time to time, as often as the Council shall see fit, to visit, enter upon, or inspect any house, premises, slaughter-yards, tanneries, fellmongering or boiling-down establishments within the Municipality, and to give such directions concerning the cleansing of the same, both within and without, as to him or them may seem needful; and any owner or occupier of the same who shall neglect to comply with such directions within a reasonable time shall forfeit and pay a sum not exceeding ten pounds.

Butchers' meat to be covered

121. Any person who shall carry or convey or cause to be carried or conveyed, in or through any public place or street the carcase or any part of the carcase of any slaughtered animal, without a sufficient and proper covering to conceal the same from public view, or who shall carry about butchers' meat for sale, without properly covering the same as aforesaid, shall, on conviction, forfeit and pay a sum not exceeding two pounds.

Savage dogs, &c.

122. Every person who shall be the keeper of, or have on his premises any dog or other animal which shall attack or endanger the life or limb of any person who may have the right-of-way or use of any private yard, alley, lane, or street, or any other place within the said Municipality, shall on conviction forfeit and pay a penalty not exceeding two pounds.

Injuring lamps, &c.

123. Any person who shall wantonly or maliciously break or injure any lamp or lamp-post set up for public convenience, or shall extinguish such lamp, shall, over and above the expense of repairing the injury committed, forfeit and pay for every such offence a penalty not more than five pounds.

Damaging public buildings, &c.

124. Any person who shall damage any public building, tollgate, wall, fence, gate, parapet, sluice, culvert, sewer, watercourse, post, bridge, pump, or any other public property within the said Municipality, shall pay the costs of repairing the same; and if such damage be wilfully done shall forfeit and pay a sum not exceeding twenty pounds.

Damaging trees.

125. Any person who shall wilfully, and without the authority of the Council, cut, break, bark, root up, or otherwise destroy or damage the whole or any part of any tree, sapling, shrub, underwood, or plant of any kind growing in or upon any street or place under the management or care of the Council, shall forfeit a sum not exceeding ten pounds.

Rain-water from roofs, &c.

126. Every owner or occupier of any dwelling-house, shop, or other building, who shall permit rain-water to fall from any roof, balcony, or other projection, upon any street, road, lane, or footway, or shall cause or permit any such roof or rain-water to be discharged by any pipe upon any such street, road, lane, or footway, shall, if such nuisance be not abated within fourteen days after notice to abate the same shall have been given by the Council, forfeit and pay for every such offence a sum not exceeding five pounds nor less than one pound.

Surface drains.

127. No surface drain shall be made in any footpath, nor any pipes laid under or across the same without the authority of the Council; and no such pipe or drain shall be used for the discharge into any street or roadway of any offensive liquid or matter of any kind whatsoever; and any person who shall so offend shall forfeit and pay a sum not exceeding five pounds nor less than ten shillings.

Information may be laid.

128. It shall be lawful for any ratepayer, or any other person residing within the bounds of the Municipality, to give such information as may be necessary for the conviction of any person offending against any of these By-laws.

Penalties.

129. Every person committing a breach of any of these By-laws shall, when no specific penalty shall have been provided by such By-laws, be liable to a penalty not exceeding two pounds.

Penalties– how appropriated.

130. All penalties under any of these By-laws shall be paid over to the Treasurer of the Municipality, subject to appropriation as provided in the Municipalities Act of 1867.

Construction of By-laws.

131. In all cases where the word "Mayor" is used in these By-laws it shall, unless the context indicate a contrary meaning, be construed also to include and signify any Alderman lawfully acting for the time being for such Mayor; and the word "Municipality" shall be understood to signify the Municipality of Queanbeyan; and the word "Council" shal signify the Council for the Borough of Queanbeyan.

Meanings attached to words.

132. In the By-laws of this Municipality any words in the singular number shall be taken to include and import the plural number, and any words in the masculine gender shall be taken to in like manner include the feminine gender, and *vice versa*, unless the same shall be repugnant to the sense and construction thereof.

Obstructing or interfering with Officers of Council.

133. Any person who shall resist, or obstruct, or interfere with any officer of the Council, or any other person doing or performing any duty or act under any of the By-laws of the said Municipality, shall forfeit and pay for every such offence a sum not exceeding five pounds.

APPENDIX.

SCHEDULE A.

Form of Distress Warrant.

I (A.B.), Mayor of the Municipality of Queanbeyan, do hereby authorize you (C.D.), Bailiff of the said Municipality, to distrain the goods and chattels in the dwelling-house or upon the land and premises of (E.F.), situate in (G.) street, Queanbeyan (or otherwise as the case may be), for (£ s. d.), being the amount of rates due to the said Municipality to the , 188 , for the said dwelling-house (or land or premises), and to proceed thereon for the recovery of the said rates according to law.

Dated this day of

(A.B.), Mayor.

SCHEDULE B.

Form of Inventory.

I have this day, in virtue of warrant under the hand of the Mayor of the Municipality of Queanbeyan, dated , 188 , distrained the following goods and chattels in the dwelling-house (or in and upon the land and premises) of (E.J.), situate at within the said Municipality for being the amount of rates due to the said Municipality to the day of

Dated this day of

(C.D.), Bailiff.

Made and passed by the Council of the Borough of Queanbeyan, this twenty-seventh day of August, in the year of our Lord one thousand eight hundred and eighty-five.

(L.S.) J. J. WRIGHT,
Mayor.

Sydney: Thomas Richards, Government Printer —1885

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(MUNICIPAL DISTRICT OF YASS—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 29th October, 1885.

MUNICIPAL DISTRICT OF YASS—BY-LAWS.

THE following additional By-laws, made by the Council of the Municipal District of Yass, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the "Municipalities Act of 1867."

P. A. JENNINGS.

MUNICIPAL DISTRICT OF YASS.

ADDITIONAL By-laws made and adopted by the Council of the Municipal District of Yass, under the 153rd section of the "Municipalities Act of 1867."

1. No person driving or riding within the Municipality shall allow his horse or horses to go out of a walking pace whilst turning any of the street corners, nor whilst passing over crossings at the intersections of streets, nor whilst passing to and from any entrance to premises intersecting the footpaths within the said Municipality.

2. Persons riding on horseback and the drivers of vehicles shall keep their left hand side of any street along which they are proceeding, keeping to the left of horsemen and vehicles passing in the contrary direction, and to the right of horsemen and vehicles proceeding in the same direction as themselves.

3. All vehicles licensed to carry passengers shall be provided with suitable lamps to burn candles, one to be fixed on each side of the driver's box, and a third one inside of all omnibuses and closed coaches, and the same shall be lighted not later than one hour after sundown and kept burning while the vehicle is on the stand or running the streets either with or without passengers.

4. All vehicles whilst travelling along any of the streets within the town boundaries shall carry at least two sufficient and properly furnished lamps on either side, and such lamps shall be kept continuously lit between sunset and sunrise whilst such vehicle is being used for the purpose of travelling.

5. No driver of any vehicle shall be or remain at such a distance from his vehicle, anywhere within the said Municipality, so as not to have immediate and full control over the same, unless he shall have previously locked the wheels thereof.

6. All persons conducting or taking horses along any street, thoroughfare, or public place within the Municipality shall keep them secured by means of halters or bridles, and shall lead them; and no person shall run or drive, or cause to be run or driven, any horse or horses loose through any such street, thoroughfare, or public place as aforesaid: Provided, nevertheless, that horses being taken to the Public Pound and afterwards impounded therein, or mobs of horses being driven to or from market shall not be within the meaning of this By-law.

7. No person shall keep, breed, or feed any swine within the distance of forty yards from any public building, place of worship, school-room, dwelling-house, public pathway, road, or street, public park, or recreation ground, or other public place within the said Municipality.

8. The owner or occupier of any house, building, passage, yard, or premises within this Municipality shall cause the yard and ground adjoining or belonging thereto, as well as all drains in connection therewith, to be kept in a cleanly condition, and so as not to be a nuisance or injurious to health.

9. All persons standing or loitering upon any of the streets, footways, crossings, or other public places in the Municipality of Yass, to the inconvenience of passers by, or in any way interrupting the traffic, shall discontinue to do so on being required by any officer or servant of the Municipal Council of the District of Yass, or any Police officer.

10. The Inspector of Nuisances, so far as relates to the By-laws hereof, and in all other cases, the said Inspector of Nuisances or any other officer duly appointed by the Council shall be the person to see the foregoing By-laws carried into effect, and to institute and prosecute all legal proceedings thereunder.

11. Any person offending against the provisions of any of the foregoing By-laws by any act of omission or commission shall upon conviction thereof, where no other punishment is specially provided, be liable to forfeit and pay a sum not more than twenty pounds nor less than ten shillings; and all fines, penalties, and forfeitures under the said By-laws shall be recovered as provided by the Municipalities Act of 1867.

The foregoing By-laws were adopted by the Council of the Municipal District of Yass, at a meeting held on the 28th day of July, 1885.

(L.S.) ALLAN WOOD,
Mayor.

CHAS. W. JENKINS,
Council Clerk.

1885-6.

NEW SOUTH WALES.

MUNICIPALITIES.

(MUNICIPAL DISTRICT OF DUBBO.—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 7th November, 1885.

MUNICIPAL DISTRICT OF DUBBO—BY-LAWS.

THE following By-laws, made by the Council of the Municipal District of Dubbo for regulating and licensing Public Carriers' Carts, and Public Vehicles, Omnibuses, Cars, Hackney-carriages, Cabs, Drays, Carts, or Vans, and the Drivers and Conductors of passenger-carrying vehicles, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the "Municipalities Act of 1867."

P. A. JENNINGS.

MUNICIPAL DISTRICT OF DUBBO.

BY-LAWS for the regulation and licensing of Public Carriers, Carts, and Public Vehicles, Omnibuses, Cars, Hackney-carriages, Cabs, Drays, Carts, or Vans, and the drivers and conductors of passenger-carrying vehicles, and in accordance with sec. 129 of the "Municipalities Act of 1867."

All vehicles to be licensed.

1. No vehicle shall ply or be used for hire within the Municipality unless the same be duly licensed in the manner herein described.

Requisition to be made for license.

2. Before any license for plying a vehicle, or to drive or to conduct the same shall be granted, the party requiring such license shall obtain from the Council Clerk, free of charge, a requisition in the form of the Schedule A hereto, or to the like effect, and duly fill up and sign the same, and deliver it to the Council Clerk, and in the case of drivers or conductors shall also obtain a certificate from two respectable householders to the effect that the applicant is of good character and competent to act as such driver or conductor as the case may be.

Condition under which licenses to be granted.

3. No license shall be granted in respect of any vehicle which in the opinion of three Aldermen who shall be appointed by a resolution of the Council of the said Municipality, is unsafe, or in bad repair, or otherwise unfit for the accommodation and conveyance of passengers therein, nor until the number of such vehicle be painted thereon on a plate or plates affixed thereon outside on the panel of each door of such vehicle, or on such other place or places, and in such manner as the said three Aldermen may direct.

Licenses, and how to be issued

4. Licenses for proprietors, drivers, and conductors of vehicles shall be in the form contained in the schedule hereunto annexed, marked with the letter B, or the like effect; and any person plying, driving, or conducting any vehicle for hire with passengers without such license shall be deemed guilty of a breach of these By-laws.

Licenses to be under Corporate Seal.

5. Every license granted under these By-laws shall be under the common seal of the Council and signed by the Mayor and countersigned by the Council Clerk, upon production of a certificate signed by the Aldermen, who shall be appointed as aforesaid, and shall be in force from the date of such license until the 31st day of December next ensuing, subject to the conditions in by-law 10; and no such license shall include more than one vehicle: Provided that where the licensed vehicle shall be under repair, if the proprietor shall so desire, he may be permitted to substitute another for a period to be then specified and endorsed on the license signed by the Mayor and countersigned as aforesaid.

Age of drivers.

6. No license shall be granted to any person to drive any passenger-carrying vehicle who shall be under the age of 18 years.

Licenses to be made out by the Council Clerk.

7. All licenses shall be made out by the Council Clerk, and numbered consecutively.

Owner of vehicle.

8. The person in whose name a license shall appear to have been obtained shall be *prima facie* deemed to be the owner of the vehicle in respect of which the same shall have been taken out.

Inspector of vehicles.

9. The three Aldermen aforesaid shall as often as they may deem it necessary, cause an inspection to be made of all or any licensed vehicle, and of the harness, horse, or horses; and if any such vehicles, harness, horse, or horses, shall at any time be found by the said Aldermen to be unfit for use, the Mayor may cancel the license of such vehicle on the written report of the said Aldermen.

Number of license to be painted on vehicle.

10. The number of the license granted to every omnibus or car in figures not less than 4 inches in height, and for every hackney carriage or cab, in figures not less than 2 inches in height, of proportionate breadth, white upon a ground o

black, shall be painted outside on the panel of the door or doors of such vehicle, or on such other part or parts thereof as the Aldermen aforesaid shall direct, and such numbers shall be kept legible and undefaced during all the time such vehicle shall ply or be used for hire.

Table of fares, &c., to be fixed to vehicle.

11. The number of license of every hackney carriage or cab on a card or plate, 6 inches by 3 inches, painted or printed in clear legible figures, and the table of fares fixed by the Council, shall be affixed at the upper part of the front panel, for in such other place or places inside of such carriage or cab as the three Aldermen aforesaid may direct; and such card or plate shall be kept so affixed and legible, and undefaced, during all the time the carriage or cab shall ply or be used for hire.

Term applied to vehicles.

12. So far as concerns fares in these By-laws any vehicle of whatever form or construction for which a hackney-carriage license has been taken out, if drawn upon four wheels, shall be deemed a hackney-carriage, and if drawn upon two wheels a cab.

Water-carts.

13. The Council shall from time to time license to ply within the Municipality such carts for the sale and carrying of water as shall upon inspection be found fit for that purpose. Every such cart shall be or shall contain or carry a vessel or tank capable of containing not less than 50 gallons, and shall have the name of the owner, and the words "licensed water-cart," painted on each cart in legible letters.

Water licenses, how obtained.

14. Every such license shall be issued on the written application of the owner thereof, in which application shall be set forth the name and surname and place of abode of the applicant; and for every such license there shall be paid to the Council the sum of 2s. 6d.; and every such license shall be in force until the 31st day of December next ensuing, after the granting of the said license.

Hawking Water—Penalty.

15. Any person hawking or carrying water for sale or hire otherwise than in a licensed water-cart as aforesaid, shall upon conviction be liable to a penalty not exceeding £1.

Name and place of abode to be painted on licensed cart, &c.

16. The name and place of abode, number of license, and the words "licensed cart, dray, or van," as the case may be, are to be painted in letters 1 inch long upon the right or off side of such cart, dray, or van.

Vehicles to carry lights.

17. All vehicles licensed to carry passengers shall be provided with suitable carriage-lamps, to burn candles, one to be fixed to each side of the driver's box, and a third one inside of all omnibuses and closed coaches; and the same shall be lighted not later than one hour after sundown, and be kept burning while the vehicles are on the stand or running in the streets, either with or without passengers.

Number of passengers to be carried.

18. When any carriage is submitted for inspection by the owner or other applicant, with a view to obtain a license, the Alderman appointed by the Council for that duty shall then determine upon the number of passengers the vehicle shall be permitted to carry, and give a certificate to that effect, such number to be mentioned in the license.

Legal fare, &c., to be painted on vehicle.

19. The number of passengers the vehicle is licensed to carry and the legal fare shall be painted or printed in legible characters and affixed within and without the vehicle in such places as the inspecting Aldermen shall direct.

Penalty for breaking By-laws.

20. For every offence against the provisions of these By-laws the offender shall, upon conviction, forfeit and pay a penalty of not more than twenty pounds nor less than ten shillings.

Vehicle not to be drawn faster than a walk past place of worship on Sunday.

21. No licensed vehicle shall be drawn by any animal or animals past a place of public worship on Sundays, during Divine service, at a faster pace than a walk, and no bugle, horn, or whistle, or other instrument shall be used on that day for the purpose of attracting passengers.

Description of persons not allowed to travel in vehicle.

22. No person suffering from an infectious or contagious disease shall ride in or upon any licensed vehicle, and no driver or conductor shall knowingly carry or permit to be carried any such person or (except to some police office or watch-house) any corpse, or any person in a state of intoxication, or who is so noisily or violently conducting himself, or otherwise so misbehaving as to occasion any annoyance, or to disturb the public peace; and no passenger shall carry inside any vehicle, except a dray, any animal or any substance of an offensive character, or that might soil or damage the vehicle or the apparel of other passengers; and no driver or conductor shall sleep in or upon any licensed vehicle nor use the same for eating his meals therein.

Vehicle not to carry greater number of passengers than licensed for.

23. No driver or conductor shall admit to the inside or allow on the outside of any omnibus at one time, a greater number of passengers than the number it shall be licensed to carry inside or outside as the case may be; and no omnibus shall be licensed for more passengers than the same will accommodate upon fit seats, properly cushioned, allowing for each passenger a space of 18 inches, measuring in a straight line, lengthwise on the front of each seat, nor shall any vehicle be taken off the line of road for which it shall be licensed: Provided that no child under five years of age, sitting on the lap, shall be deemed a passenger within the meaning of these By-laws. No passenger to carry more than one child.

Fare not to be increased until 10 p.m. Driver, &c., not to refuse to carry passengers.

24. No owner, driver, or conductor of any omnibus shall demand, receive, or take from any passenger a larger fare than shall be shown in large immovable figures in some conspicuous place inside and outside the omnibus, as the fare for which such omnibus plies: Provided that no fare shall be increased, except between the hours of 10 o clock at night and 5 o'clock in the morning. And no driver or conductor of an omnibus shall neglect or refuse to admit and carry any person for whom there is room and to whom no reasonable objection can be made under these By-laws; nor except in cases of accident or other unavoidable cause shall any driver or conductor stop such vehicle upon any place where foot passengers usually cross the carriage way.

Fare to be paid upon taking seats.—Driver and conductor to be provided.

25. Any person having taken his seat in or upon an omnibus shall pay the fare when demanded after the commencement of his journey. The owner of every omnibus plying for hire shall provide the same with a licensed driver and a licensed conductor.

Property found in vehicles to be delivered at Council Clerk's Office.

26. The driver of any carriage and conductor of every omnibus shall carefully examine his vehicle immediately after setting down his fare, and in every case of property having been left in any vehicle by any person having used or hired the same, such property if found by another passenger or person shall be delivered to the driver or conductor, who shall deliver the same, with any other property found by him, within eighteen hours after such finding to the Council Clerk's office, and shall there deposit it; and no owner shall detain any property delivered to him by any driver or conductor in his employment longer than the time before-mentioned, but shall deposit it at the office at the Council Chamber with the Council Clerk or his assistant.

License Fees to be paid to Council Clerk

27. For every license issued under the By-laws in force for the time being in that behalf within the said Municipality there shall be paid to the Council of the said Municipality, by delivering the same to the Council Clerk, or other person authorized to receive the same, the several sums mentioned or set forth in Schedule C to these By-laws for the general purposes of the said Borough.

Terms to be applied to licensed vehicles.

28. Whenever the word "vehicle" shall be used in these By-laws the same shall be construed to extend and apply to any omnibus, car, hackney-carriage, or cab.

The word "omnibus" shall extend and apply to any vehicle upon four wheels drawn by two or more horses, having seat accommodation for more than ten passengers and a driver. The word "car" shall extend and apply to any vehicle upon two or four wheels drawn by one or more horses, having seat accommodation for not more than ten or less than five passengers and a driver.

The word "hackney-carriage" shall extend and apply to any vehicle upon four wheels drawn by two or more horses, and having seat accommodation for not more than five passengers and a driver, and in respect of which a hackney-carriage license within the said Municipality shall have been obtained. The word "cab" shall extend and apply to any vehicle upon two wheels having seat accommodation for not more than two passengers and a driver, in respect of which a cab license within the said Municipality shall have been obtained. The word "cart" shall extend and apply to any cart, dray, van, or waggon, drawn by one or more horses or other animals, used wholly and for the carriage of goods and parcels. The word "water-cart" shall extend and apply to any cart used for the carriage of water within the said Municipality in respect of which a water-cart license shall have been obtained.

Fares to be charged.

29. No proprietor or driver of any hackney-carriage or cab in the said Municipality shall demand, receive, or take more than the several fares or sums mentioned or set forth in the Schedule D to these By-laws, or such other sums as the Council of the said Municipality shall from time to time determine or appoint in substitution therefore as hereinafter provided; and every proprietor, driver, or conductor failing to comply with this By-law shall for every such offence forfeit and pay a penalty or sum not exceeding five pounds nor less than five shillings.

Power of Council to amend Scale of Fares, &c.

30. The Council of the said Municipality may from time to time, by resolution passed in that behalf, alter and vary or amend the said Schedule D and the respective sums chargeable thereunder, or any of them, and such alterations, variations, or amendments shall become of full force and effect so soon as the same shall have been publicly notified by advertisement in the New South Wales *Government Gazette*, and at least one newspaper circulating in the said Municipality, and the Council of the Municipality shall not be responsible for any loss which such alterations or amendments may have or may be alleged to have occasioned to the holders of licenses for the time being, or any of them.

Tolls to be paid by hirer.

31. All tolls to be paid by the hirer of any hackney-carriage or cab in addition to the ordinary fare.

Passengers to be taken up, &c.

32. No driver of any hackney-carriage or cab shall refuse to take up any passenger or passengers unless already engaged for hire, nor refuse to convey such passenger or passengers to such place or places within the said Municipality as he, she, or they may reasonably desire; and every person failing to comply with this by-law shall forfeit and pay a penalty or sum not exceeding five pounds for every such offence.

Cab Stands, &c.

33. The Council may by resolution, to be publicly notified as in by-law 30 of this part, from time to time appoint any place or places within the said Municipality as stands for licensed hackney-carriages and cabs within the said Municipality.

34. No vehicle shall be allowed to stand or remain stationary on any street within the said Municipality, except on the duly appointed cab-stand for the time being for a longer period than the time reasonably necessary to take up or set down any passenger or passengers for the time being, requiring or using the same, or for loading or unloading or receiving or delivering the goods or parcels which the driver of such vehicle shall have been employed to carry; and any driver or proprietor of any such vehicle remaining stationary contrary to this by-law shall for every such offence forfeit and pay a penalty or sum not exceeding five pounds nor less than five shillings.

Driver not to leave his horse or horses.

35. No driver of any licensed vehicle shall be or remain at such distance from his horse or horses, while attached to his vehicle, anywhere within the said Municipality as not to have immediate and full control over the same; and every person so doing shall for every such offence forfeit and pay a penalty or sum not exceeding five pounds nor less than five shillings.'

Speed at which to travel.

36. Al hackney-carriages and cabs carrying passengers shall (except when turning street corners) proceed at a speed of not less than six miles per hour unless when attending funerals or when otherwise ordered by the hirer; and every driver of any such carriage or cab failing to comply with this by-law shall forfeit and pay a sum not exceeding forty shillings nor less than five shillings.

Copies of Schedule D to be printed and fixed at cab stand.

37. Copies of said Schedule D hereto shall be printed or written in legible characters and exhibited on boards placed in conspicuous positions—one at each cab-stand within the Municipality and one at the Railway Station in such place as the Commissioner for Railways may approve.

Copies of By-Laws to be given with License.

38. Copies of these and of all other By-laws passed by the Council of the said Municipality for the regulation of licensed vehicles and still remaining in force shall be delivered with each license issued unless the person shall have previously received copies thereof.

Penalty to be enforced for breach of By-laws.

39. All proprietors and drivers of licensed vehicles shall at all times be amenable to and observe and comply with the By-laws for the time being in force for the care and management of the public roads, public streets, and public thoroughfares within the said Municipality, and for every breach thereof shall incur the same penalties as other persons.

40. Any person offending against any of these By-laws shall, except when otherwise expressly provided, forfeit and pay a sum not exceeding two pounds nor less than five shillings.

SCHEDULE A.

A Requisition for License.

To the Municipal Council of the Municipal District of

I, residing at street, within the Municipality of Dubbo, do hereby request that a license may be granted to me to within the limits of the said Municipality.

Dated at this day of A.D. 18

Description of vehicle:

SCHEDULE B.

Form of License for Driver or Conductor.

THIS is to certify that of street, is hereby licensed to drive or conduct from the day of to the 31st day of December, 18 inclusive, within the Municipality of subject nevertheless to all and every the By-laws, Rules, and Regulations in force relating thereto.

SCHEDULE C.

TABLE of License Fees payable by Proprietors, Drivers, and Conductors of Licensed Vehicles.

Proprietors of	On and after 1st January.	On and after 1st April.	On and after 1st July.	On and after 1st October.
	£ s. d	£ s. d.	£ s. d.	£ s. d.
Omnibuses and coaches	2 0 0	1 10 0	1 0 0	0 10 0
Hackney-carriages and cabs, cars	2 0 0	1 10 0	1 0 0	0 10 0
Water-carts, drays, milk-carts	0 10 0	0 7 6	0 5 0	0 2 6
Lorries	3 0 0	2 5 0	1 10 0	0 15 0
Delivery-vans & vegetable-carts.....	1 0 0	0 15 0	0 10 0	0 5 0

	s.	d.
For every driver's license for a vehicle to carry passengers, per annum, or any part thereof	5	0
For every driver's license for a Lorry, per annum, or any part thereof	5	0
For every conductor's license for a vehicle to carry passengers, per annum, or any part thereof	5	0

SCHEDULE D.

TABLE of maximum fares chargeable by drivers or proprietors of Licensed Carriages and Cabs, within the Municipal District of Dubbo:—

	s.	d.
For not exceeding quarter of an hour	1	6
For every subsequent quarter of an hour, or part thereof	1	0

N.B.—After 10 o'clock p.m., and before 5 o'clock a.m., half the above fares in addition.

Made and passed by the Municipal Council of Dubbo, this eleventh day of May, in the year of our Lord one thousand eight hundred and eighty-five.

(L.S.) ROBERT BOOTH,
Mayor.

S. W. HEAYDON, Council Clerk,
Town Hall, 11th May, 1885.

Sydney: Thomas Richards, Government Printer—1885.

[3d.]

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(MUNICIPAL DISTRICT OF LEICHHARDT—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 26th October, 1885.

MUNICIPAL DISTRICT OF LEICHHARDT.—BY-LAWS.

THE following By-laws, made by the Council of the Municipal District of Leichhardt, repealing section 16 of Part 1, of the By-laws of the Municipal District, and according the Mayor of the Municipality the privilege of moving or seconding motions and of speaking once on any motion or amendment before the Council respectively, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the "Municipalities Act of 1867."

P. A. JENNINGS.

THAT clause 16 of Part 1 of existing By-laws be and the same is hereby rescinded.

The additional By-law as follows:—

That the Mayor or Chairman of the Council of this Municipal District shall have the right of either moving or seconding any motion and have the privilege of speaking once on any subject or amendment introduced. The Mayor or Chairman shall rise when so speaking (unless prevented by some bodily infirmity from so doing), but shall be considered as still presiding.

Made and passed by the Municipal Council of the Municipal District of Leichhardt, in Council assembled, this twenty-fourth day of August, 1885.

By order of the Council,

(L.S.) JOHN YOUNG,
Mayor.

WALTER BEAMES,
Council Clerk.

1885-6.

NEW SOUTH WALES.

MUNICIPALITIES.

(MUNICIPAL DISTRICT OF LEICHHARDT—BY-LAW.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 7th April, 1886.

MUNICIPAL DISTRICT OF LEICHHARDT.—BY-LAW.

THE accompanying By-law, made by the Council of the Municipal District of Leichhardt, repealing No. 31 of the By-laws of the Municipality, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the "Municipalities Act of 1867."

GEORGE R. DIBBS.

BY-LAW No. 31 of the By-laws of the Municipal District of Leichhardt was repealed by the Municipal Council in Council assembled this 25th day of January, 1886.

By order of the Council,
(L.S.) JOHN YOUNG,
Mayor.

WALTER BEAMES,
Council Clerk.

[3d.] 354—

1885-6.

NEW SOUTH WALES.

MUNICIPALITIES.

(MUNICIPAL DISTRICT OF MANLY—AMENDED BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 23rd November, 1885.

MUNICIPAL DISTRICT OF MANLY—AMENDED BY-LAWS.

THE following amended By-laws made by the Council of the Municipal District of Manly, having been confirmed by His Excellency the Lieutenant-Governor, with the advice of the Executive Council, are published in accordance with the requirements of the "Municipalities Act of 1867."

ALEX. STUART.

BY-LAWS OF THE MUNICIPALITY OF MANLY.

By-laws repealed.

THE following By-laws of the said Council of the Municipality of Manly, dated January 9th, 1878, and published in the Government Gazette of the 9th January, 1878, No. 14, are hereby repealed, viz.:—

Part 4, No. 21—"Damaging trees."
Part 6, No. 5—"Erection of houses, &c."
Part 3, No. 7—"Placards not to be affixed on walls, &c."

Persons obstructing Overseer, &c.

1. Any person who shall wilfully obstruct or interfere with the Surveyor or other Officers of the Council, or any person acting for or under him or them, in the exercise of any of the duties or powers by these By-laws imposed, shall on conviction forfeit and pay a penalty of not less than two pounds nor more than twenty pounds.

Allowing filth to flow from premises

2. Any person or persons allowing any filth or offensive matter to flow or come from his or her premises, shall be liable to a penalty of not less than forty shillings nor more than twenty pounds.

Loitering in streets, &c.

3. Any person or persons remaining or loitering in or obstructing any road, street, footway, or other public place within the Municipality, to the inconvenience of the passers-by, or in any way interrupting the traffic, shall discontinue to do so on being required by any officer or servant of the Municipal Council or any Police Officer, and failing to comply with such request, shall be liable to a penalty of not less than ten shillings nor more than ten pounds; and for any subsequent conviction shall be liable to a penalty of not less than two pounds nor more than twenty pounds.

51—

Affixing placards on walls, and painting thereon.

4. It shall not be lawful for any person to paste or otherwise affix any placard or other paper or notice upon any wall, fence, post, stone, pillar, railing, house, or building; nor to deface or mark any such wall, fence, post, pillar, rocks, railing, house, or building by chalk or paint or in any other manner, unless with the consent of the owner thereof; and any person who shall be guilty of any such offence, shall forfeit and pay a sum not less than ten shillings nor more than ten pounds.

Recreation Grounds.

5. Parks or places of a like nature for the purpose of public recreation may be established by the Council, either within the boundaries of the said Municipality or in any public reserve adjacent thereto, which, or the use of which, may be granted to the Council for the purpose of public recreation, upon such terms as the Council shall by resolution approve; and the Council may make rules and regulations for the management and maintenance of such places of recreation, and any person breaking any of such rules and regulations shall be liable to a penalty not exceeding twenty pounds nor less than one pound.

No balcony, &c., to project.

6. With regard to buildings hereafter to be built or rebuilt, it shall not be lawful for any awning, verandah, portico, balcony, or window, forming part of or attached to any external wall, to project beyond the building line of any street or road, except with the consent of the Council first obtained; nor shall any balcony, or any other external projection as aforesaid, which may hereafter be added to any existing building, be allowed to project as aforesaid, under a penalty not exceeding twenty pounds nor less than five pounds, except with the consent of the Council first obtained. Provided that no such awning, verandah, portico, or balcony, shall be permitted to be erected in any street less than feet wide; provided also that any person desiring to erect any such structure shall first submit a plan for the approval of the Council.

Notices not to be painted on pavement.

7. Any person who shall stamp, stain, paint, write, or post any advertisement or notice upon any footway or kerbstone within this Municipality, shall be liable to a penalty not exceeding two pounds nor less than ten shillings.

Trees in streets.

8. The Council shall have power to plant trees, shrubs, and plants in the streets, reserves, and public ways of this Municipality, and any person wilfully injuring or destroying any of such trees, or any railing, fence, or thing protecting the same, shall on conviction forfeit and pay a penalty of not more than ten pounds nor less than two pounds, in addition to the value of the trees, railing, fence, or thing so injured.

Erection of houses, &c.—Fee for permission.

9. No person shall be permitted to erect any house, shop, or other building or fence in any street, lane, or place within the Municipality without having first served notice in writing to the Mayor or Council Clerk before commencing the same, stating his intention and describing the proposed situation of the building or erection, and shall, at the time the said notice is given as aforesaid, pay to the Council Clerk a fee of five shillings for permission to erect any such fence, house, shop, or building in any street, lane, or other place within the said Municipality, and every owner thereof, and every contractor for such house, shop, or building, or any part thereof, commencing to build or work thereon without such notice having been given, shall forfeit and pay for every such offence any sum not exceeding two pounds nor less than five shillings.

No private sewers to be made to communicate with the public sewers without notice.

10. It shall not be lawful for any person, without notice to the Council or otherwise than according to such plans and directions as such Council make and give, to make or branch any private drain or sewer into any of the public drains or sewers, or into any drain or sewer communicating therewith; and in case any person or persons shall make or branch any private drain or sewer communicating or to communicate therewith without such notice, or otherwise than as aforesaid, every person so offending shall for every such offence forfeit and pay any sum not exceeding fifty pounds, and shall, at his own expense, make good all roads, streets, kerbing, &c., which shall have been injured by or through any such work; and all such repairs shall be performed to the satisfaction of such Officer as the Council shall appoint to superintend such work; and any person who shall do or perform anything contrary to this clause, or shall neglect to make good all such damage as aforesaid, shall on conviction thereof forfeit and pay a sum not exceeding fifty pounds nor less than one pound.

Passed by the Municipal Council of Manly, this 26th day of March, 1885.

(L.S.) CHARLES R. AUSTIN,
Acting Mayor.

JAS. JONES,
Council Clerk.

Sydney: Thomas Richards, Government Printer.—1885.

[3d.]

1885-6.

NEW SOUTH WALES.

MUNICIPALITIES.

(MUNICIPAL DISTRICT OF SOUTH SINGLETON.—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 10th December, 1885.

MUNICIPAL DISTRICT OF SOUTH SINGLETON.—BY-LAWS.

THE following By-laws made by the Council of the Municipal District of South Singleton, having been confirmed by His Excellency the Lieutenant-Governor, with the advice of the Executive Council, are published in accordance with the requirements of the Municipalities Act of 1867.

P. A. JENNINGS.

BY-LAWS OF THE MUNICIPAL DISTRICT OF SOUTH SINGLETON. PROCEEDINGS of the Council and Committees; preservation of order at Council Meetings; duties of officers and servants, &c.; prevention and extinguishing of fires; care and management of public roads; suppression of nuisances and houses of ill-fame, &c.; and for the general good rule and government of the Municipal District.

Standing orders.

1. The meetings of the Council shall be held monthly on Tuesdays at the hour of 8 o'clock p.m., except as provided under clause 103 of the Municipalities Act of 1867.

2. The Mayor or Chairman shall preserve order, and when required, or called upon, to decide a point of order or practice, he is to state the rule, custom, or precedent, applicable to the case, without argument or comment.

3. The Mayor or Chairman may take part in all the proceedings of the Council.

4. All questions duly proposed shall be put by the Mayor or Chairman, and the sense of the Council thereon shall be declared by him.

5. Every question shall be put in the affirmative, and then in the negative; and this may be done as often as the Mayor or Chairman shall deem necessary for enabling him to determine which side has the majority.

6. No member, having taken his seat, shall be allowed to withdraw, without asking the permission of the Chairman.

7. If two or more members rise to speak at the same time, the Mayor or Chairman shall decide which of them is entitled to pre-audience.

8. The Mayor or Chairman may without waiting for the interposition of any member of the Council, call to order any member proceeding to speak a second time on the same question, except in explanation.

Order of business.

9. The business of each ordinary meeting of the Council shall be transacted in the following order, viz.:—

(*a.*) The reading and confirmation of the minutes of the previous meeting.
(*b.*) The reading of official correspondence.
(*c.*) The presentation of petitions.
(*d.*) Reports brought up from Committees.
(*e.*) Miscellaneous business.
(*f.*) Motions of which notice has been given.
(*g.*) Notices of motion.
(*h.*) Consideration of Tenders.
(*i.*) Orders of the day.

10. The question for confirming the minutes of the previous meeting shall be proposed by the Mayor or Chairman immediately upon their being read, and shall be to the effect that the minutes now read are a correct record of the proceedings, and no discussion shall be allowed thereon, except on the point of accuracy.

Rules of debate.

11. Every member shall stand when speaking, and shall address the Chair.

12. Except in Committee no member shall speak more than once on the same question, unless in explanation, when misrepresented or misunderstood; provided, however, that the mover of the question shall be allowed the liberty of reply; and provided further that every member shall be at liberty to speak once on any amendment as well as on the original motion; but the right of reply shall not extend to the mover of an amendment.

13. No member shall speak upon any motion or amendment for a longer time than fifteen minutes, unless by permission of the Council.

14. No member shall digress from the matter under discussion, nor make personal reflections on members, nor impute motives.

15. When any member shall use any expression which the Mayor or Chairman, or any alderman shall think capable of being offensively applied to any other member, the member so offending shall be required by the Mayor or Chairman to withdraw the expression, and to make a satisfactory apology to the Council.

16. No alderman, when discussing any matter, shall be interrupted, unless by a call to order when he shall sit down. The alderman calling to order shall then be heard, and the question of order decided before the debate or any other business is resumed.

17. Any member may require the question under discussion to be read for his information at any time during a debate, but not so as to interrupt any other member when speaking.

18. A debate may be adjourned to a later hour of the evening, or to another evening specified, and the member on whose motion a debate is adjourned, shall be entitled to pre-audience on resumption of the debate.

Divisions.

19. It shall be competent for any member to divide the Council upon any question put from the Chair, either in full Council or Committee of the Council; and upon such division those who are on the affirmative shall place themselves on the Mayor's or Chairman's right hand, and those who are on the negative shall place themselves on his left hand; and no member shall leave his place until the names of all the members present have been taken down by the Council Clerk, or person officiating for him.

20. All divisions of the Council shall be entered on the minutes of the proceedings.

Motions.

21. Motions shall take precedence of Orders of the Day, and be moved or postponed in the order in which they stand on the Notice Paper, or lapse.

22. No motion shall be put unless it be seconded.

23. When a motion has been proposed and seconded, it shall be the property of the Council, and shall not be withdrawn without the consent of the Council.

24. Any number of amendments may be proposed on a motion before the Council; and when more than one amendment is moved and seconded, the question shall first be put on the last amendment, and then on the one next to the last, and so on, in the inverse order to that in which they have been moved; provided, however, that when such motion or amendment shall relate to the fixing of salaries, rates, or other matters of finance, the lowest sum shall be put first, then the next lowest, and so on to the highest.

25. Any motion for adjournment, if seconded, shall be put immediately, without discussion, but if such motion be negatived, it shall not be competent for any member to make a similar motion until at least half an hour shall have elapsed from the period of moving the one that has been negatived.

26. No motion, the effect of which, if carried, would be to rescind, or be repugnant to any resolution which has been passed by the Council shall be entertained within three months, unless a call of the whole Council has been duly made for that purpose; and no such motion, if negatived by the Council, shall be again entertained during a period of three months.

27. Matters of extreme urgency may, with the consent of the Council, be brought under consideration without notice being previously given.

28. A book, to be called a "motion book," shall be provided by the Council, for the purpose of immediate reference, in which the Council Clerk shall enter all motions duly made, and amendments thereon, if any, specifying the manner in which such motions or amendments have been dealt with.

Petitions.

29. It shall be incumbent on any member presenting a petition to acquaint himself with the contents thereof, and to report to the Council that it does not contain any disrespectful language.

30. On the presentation of a petition no debate shall take place, and the only question that can then be entertained by the Council shall be, that the petition be received, or that it be referred to a Committee; provided, however, that any petition that has been received by the Council may be taken into consideration upon notice of motion being given in the usual way.

31. Every petition received by the Council shall be received only as the petition of the party or parties whose signature or signatures it bears; and no petition shall be received unless at least one signature be upon the sheet containing the petition.

Committees.

32. In a Committee of the Whole Council the general rules of the Council shall be observed, except the rule limiting the number of times of speaking.

33. Every report of a Committee shall be signed by the Chairman thereof.

34. When the report of a Committee is brought up and presented to the Council, the question as to its reception may be moved and put at once; but it shall not be adopted, or taken into consideration, without notice in the usual way.

35. There shall be three Standing Committees, to be called respectively—the Committee of Finance (of which the Mayor shall be Chairman), the Improvement Committee, and the General Committee; and the members of all such described Committees shall be chosen by ballot.

36. The Standing Committees shall be appointed for the municipal year at the first meeting of the Council after the election of the Mayor of the Municipality; and any vacancies occurring therein during the year shall be filled up by the Council.

37. All reports of Committees shall be fairly written on foolscap paper for the convenience of filing or binding.

Finance Committee.

38. No matters of account shall be disposed of by the Council until they have been examined and reported upon by the Committee of Finance.

39. The Chairman may, however, with the assent of two members of Committee, under signature, authorize the expenditure of any sum not exceeding ten pounds, during any recess; and such expenditure shall be reported to the Council at its next meeting, and the usual draft obtained for payment thereof.

40. All drafts upon the funds shall be signed by the Mayor of the Municipality and one member of the Finance Committee, and be countersigned by the Council Clerk.

41. The Mayor of the Municipality shall, in all cases, give the necessary information to the bankers, whose signatures are necessary to constitute a genuine draft.

42. No accounts of any kind whatsoever, except those otherwise specially provided for, shall be paid, except at the usual meetings of the Council, or until such accounts shall have been first passed by the Finance Committee, and be then allowed by the Council.

43. No contract shall be paid for until such contract shall have been fully completed to the satisfaction of the Committee under whose authority the contract was entered into, nor by it, unless in the form prescribed for other payments.

Improvement Committee

44. No public work of any character shall be undertaken (except as in Rule 42 of Finance Committee By-laws) until the nature thereof and estimate of probable cost be first brought before the Council for consideration and approval.

45. All accounts against the Corporation, relating to works, shall be examined by the Improvement Committee, and, if found correct, shall be passed to the Finance Committee for payment in the usual manner.

General Committee.

46. All matters which the Council shall think fit to refer to a Committee, and which do not fall within the province of any other Standing Committee, shall be referred to the General Committee; provided, however, that the Council may, at any time, refer such matters to a Committee to be appointed for that special business.

Making By-laws.

47. Before any proposed by-law is discussed in Council a copy thereof shall be open for public inspection, in the office of the Corporation, not less than seven days.

48. No By-law shall be passed until it has been reported upon by a Committee of the Whole Council nor until it has been twice read in Council on different days.

49. All By-laws, when confirmed and published as the Municipalities Act of 1867 directs, shall be fairly transcribed into a book to be kept for that purpose, signed by the Mayor, and countersigned by the Council Clerk; and the said book shall, at all reasonable times, be open to public inspection.

Miscellaneous.

50. Works undertaken by the Council and estimated to cost over £20 (twenty pounds) shall be let by tender, and no tender shall be entertained unless it be accompanied by an agreement, signed by one or more respectable parties, as sureties for due performance of the contract.

51. Any member may record his protest against any decision of the Council, provided that the protest be handed to the Council Clerk not later than the next Council meeting; and provided, also, that notice of his intention to protest be given immediately on the passing of the resolution to which the protest refers.

52. The common seal shall not be affixed to any document without the express authority of the Council; and every impression thereof, so authorized, shall be verified by the signatures of the Mayor and Council Clerk, or in case of illness or absence of the Mayor by two aldermen, and countersigned by the Council Clerk.

53. No officer of the Corporation shall be at liberty to show, lay open, or expose, any of the books, papers, or records of the Corporation to any person other than an Alderman, without leave from the Council, except as otherwise provided for by section 108 of Municipalities Act of 1867.

54. In cases where security is required by clause 151 of the Municipalities Act of 1867, no sureties shall be accepted, otherwise than by a vote of the Council; and it shall not be competent for the Council to accept, as sureties, any of its own members, nor any person holding office in the Corporation.

55. Any one or more of the Standing Orders may be suspended *pro tempore* in a case of emergency, if a majority of the Council then present shall deem such suspension necessary.

56. All books, deeds, memorials, letters, documents, and other records of the Council, except as hereinafter mentioned, shall be kept at the Council Chambers, in the custody and care of the Council Clerk, who shall be responsible for the safe custody of the same: but the Mayor may for any special purpose authorize their removal.

The Bailiff and his duties.

57. The bailiff shall be appointed by a resolution of the Council, and may be at any time removed in a similar way.

58. The bailiff shall make all levies and distresses for the recovery of rates under warrant, in the form of the schedule hereto annexed and marked with the letter A, under the hand of the Mayor or any person who may for the time being be duly authorized to perform the duties of that office.

59. At the time of making a distress the bailiff shall forthwith make out a written inventory, in the form or to the effect of the schedule annexed hereto, and marked with the letter B, which inventory shall be delivered to the occupant of the land or premises, or the owner of the goods so distrained, or to some person on his or her behalf, resident at the place where the distress has been made; and in case there shall be no person at such place, with whom such inventory can be left as aforesaid, then such inventory shall be posted on some conspicuous part of the land or premises on which the distress has been made, and the bailiff shall give a copy of the inventory to the ratepayer, on demand, at any time within one month after the making of such distress.

60. The bailiff, in making a distress as aforesaid, may impound or otherwise secure the distress so made, of what nature or kind soever it may be, in such places or in such part of the land or premises chargeable with the rate, as shall be most fit and convenient for this purpose; and it shall be lawful for any person, whatsoever, after the expiration of the five days hereinbefore mentioned, to come and go to and from such place or part of the said land or premises where any distress shall be impounded and secured as aforesaid, in order to view and buy, and in order to carry off and remove, the same on account of the purchaser thereof.

61. The owner of any goods so distrained upon may, at his or her option, direct and specify the order in which they shall be successively sold; and the goods and chattels shall, in such case, be put up for sale according to such direction.

62. The bailiff shall hand over to the Council Clerk all proceeds of such distresses within forty-eight hours after having received the same.

63. The bailiff, with the sanction of the Mayor of the Borough, may authorize any person to act temporarily as his deputy; and the person thus authorized shall have and exercise for the time being, all the powers of the bailiff himself; but the bailiff and his sureties shall, in every case, be held responsible for the acts of such deputy.

64. The bailiff shall be paid for every levy made under these By-laws, according to the schedule hereunto annexed, marked C.

65. The bailiff, and such assistants as he may take with him, shall enter into any part of the land, building, or tenement in respect of which a warrant has been issued for the recovery of any rate or rates as aforesaid, and to distrain the goods therein or thereon, and to remain in such building, tenement, or other property in charge thereof; and if the sum for which such distress shall have been made or taken shall not be paid on or before the expiration of two days, it shall be lawful for the bailiff to sell the goods so distrained, or a sufficient portion thereof; and if the party distrained upon shall so require, by public auction, either in the premises or at such other place within the Borough as the bailiff may think proper to remove thereto, such party consenting in writing to pay the charges of the auctioneer, if so sold; and the surplus, if any remain after deducting the amount distrained for, together with the expenses attendant upon such distress and sale, shall be paid over to the owner of the goods so sold: Provided that nothing herein contained shall apply to the sale of any produce whatever which may be growing upon the land at the time of making the distress: Provided always, that no distress shall be made on the goods of any casual visitor, or on the goods of any lodger in any house or apartment ordinarily let or used as a lodging-house or apartment.

SCHEDULE A.

Warrant of Distress.

I, the Mayor of the Municipal District of South Singleton, do hereby authorize you, bailiff of the said Municipal District, to distrain the goods and chattels in the dwelling-house, or in and upon the land and premises of situate at for the sum of being the amount of Municipal rates due to the Municipal District, to the day of for the said dwelling-house, land, or premises (as the case may be), and to proceed thereon for the recovery of the said rates, according to law.

Dated this day of 18 .

Mayor.

SCHEDULE B.

Inventory.

I have this day, in virtue of a warrant, under the name of the Mayor of the Municipal District of South Singleton, dated distrained the following goods and chattels in the dwelling-house, or in and upon the land and premises of situate at , within the Municipal District of South Singleton, for the sum of , being the amount of rates due to the said Municipal District to the day of 18 .

Dated this day of 18 .

Bailiff.

SCHEDULE C.

Fees to bailiff.

For making entry and inventory, five shillings; if in possession more than five hours, five shillings additional; and for every subsequent day whilst in possession, five shillings; and five shillings per cent. on the net amount of sale.

Prevention and extinguishing of fires.

66. It shall not be lawful for any persons to burn any shavings, or other matters or things in any street, road, or public place within the Municipality.

67. No householder shall place, or knowingly permit to be placed, in any house, yard, workshop, out-houses, or other premises, fire, powder, or combustible materials of any kind, in such a manner as to endanger contiguous buildings.

68. The Mayor upon the representation of any two householders, that fire is being used to the danger of contiguous buildings, shall cause three days' notice in writing (unless the urgency of the case requires that it should be removed at once) to be given to such householder, to show cause why the same should not be removed or remedied, and an opportunity thereupon given to show such cause.

69. For every offence against the provisions of these By-laws the offender shall be liable to a penalty not exceeding ten pounds, to be recovered in a summary manner before any Justice, as provided by the Municipalities Act of 1867, section 193.

70. Every owner and driver of a licensed water-cart shall keep such cart loaded with water during all times after sunset and before sunrise, and shall, if any building, premises, or property shall be on fire within the Borough, attend at the place of such fire with such cart loaded with water, and shall continue to cart water by full loads to such place, and shall deliver such water in such manner as may be required by the Mayor, or by any alderman or person duly authorized by the Council in that behalf, and then present for extinguishing such fire; and every such owner or driver who shall without reasonable excuse fail to comply with the provisions of this section shall forfeit a sum not exceeding ten pounds, nor less than two pounds.

71. There shall be paid out of the Borough funds to the owner of every licensed water-cart who shall have attended with any water at the place of any fire as herein provided, and delivered the same as required for extinguishing such fire, such reasonable compensation as the Council shall, by resolution, have appointed in that behalf, and also to such owners of such carts as shall have first and second in order attended with loads of water, such further sums by way of reward as the Council may by similar resolution have fixed.

Care and management of the public roads and streets and public thoroughfares of the Borough.

72. The surveyor of the Municipality, duly appointed by the Council thereof, or any person acting for him, shall be the proper person for marking out, when necessary, any roads, streets, or thoroughfares, in actual public use as such within the Borough; in marking out such roads, streets, or thoroughfares recourse shall be had, when practicable, to the plans under which lands, with frontage to the road, street, or thoroughfare in question shall have been sold; and it shall be the duty of the surveyor, or any person acting for him, to place posts at the corners or intersections of any roads, streets, lanes, or thoroughfares, wherever the same may be considered necessary or desirable by the Municipal Council, so as to give a width of forty-two feet, at least for the carriageway, and twelve feet at least for the footway on each side when the street shall be sixty-six feet wide; and in proportion, and in the discretion of the said surveyor, or person acting for him, in any public roads, streets, lanes, or thoroughfares of other width than sixty-six feet.

73. Whenever any road, street, or lane has been marked out in the manner herein provided, no house, shop, fence, or other structure shall be erected or allowed to project or encroach on any part thereof.

74. Whenever any footways shall have been marked out, the surveyor or person acting for him, may, with the sanction of the Council, cause the same to be levelled and made, as nearly as practicable, of equal height and breadth, and with an equal slope and inclination, and for this purpose may remove any flagging, steps, or other matter or thing that may injure or obstruct the said footway, or render unequal or inconvenient, and which now is, or may hereafter be, erected or placed on the space marked out for any of the said footways.

Obstructions and encroachments.

75. The surveyor may at any time, or the person acting as such, on the order of the Council, and upon due notice of ten days, direct the removal of any fence, building, or other obstruction or encroachment which shall be made in and upon any road, street, lane, or thoroughfare, under the charge of the Council; notice shall in this case be served, either personally, or at the usual or last known place of abode of the person to whom such obstructive or encroaching structure belongs, or who has erected the same, or caused it to be erected, or who may be in charge of the same.

76. In any case where after the service of notice for the removal of any obstruction or encroachment as aforesaid, the person causing the same shall not remove it within a reasonable time, it shall be lawful for the Council to direct the removal of the same, under the superintendence of its own proper officer, and at the cost of the owner or of the person thus offending, or of the person who may be in charge thereof: Provided that the expenses thereby incurred shall in no case exceed the sum of ten pounds, to be recovered summarily in manner provided for the recovery of penalties under these By-laws.

77. In case where the obstruction or encroachment cannot be removed, unless at a greater cost than ten pounds, it shall be open for the Council to direct such removal, and to pay all costs thereof, above ten pounds, from the Municipal funds, or to proceed by action of trespass against the person causing such obstruction or encroachment, or who may be in charge thereof.

78. The foregoing provisions shall be equally applicable to all obstructions by digging or excavation.

79. The surveyor, or person acting for him, may, at any time, by order of the Council, cause the traffic of any street, lane, or thoroughfare, or any portion thereof, to be stopped for the purpose of repairing the same, or for any necessary purpose; and any person or persons offending against this By-law, either by travelling on or by removing or destroying any obstruction that may be placed thereon, for the purpose of suspending the traffic, shall forfeit and pay a penalty of any sum not exceeding five pounds for every such offence.

80. No person shall be allowed to obstruct any pathway, road, street, or public thoroughfare, within the Municipality, by building materials, drays, carts, goods, merchandise, or anything whatsoever calculated to obstruct or hinder free passage, without the sanction of the Mayor in writing; and no person shall be allowed to leave waterholes or excavations for cellars or other purposes unfenced, or in such a manner as to be dangerous to passers-by; and at all places where buildings are being carried on, or where any obstruction to the danger of passers-by exists, the person causing such obstruction shall be required to provide lights on either side, and keep the same lighted from sunset to sunrise. Any person so offending shall forfeit and pay for the first offence a sum not exceeding two pounds; for the second offence a sum not exceeding five pounds; and for the third offence a sum not exceeding ten pounds.

Trespasses and removal of nuisances.

81. Any person who shall cast any filth, rubbish, or any dead animal, or any animal, with intent of drowning, into any public watercourse, sewer, waterhole, river, creek, or canal, or who shall suffer slops, suds, or filth of any kind to flow from his or her premises into any such watercourse, sewer, waterhole, river, creek, or canal, or who shall permit or suffer any such slops, suds, or filth to flow from his or her premises over any of the footways or streets of the Municipality, or shall permit or cause, by means of pipes, shoots, channels, or other contrivances, filth of any kind whatsoever to flow into any public watercourse, sewer, waterhole, river, creek, or canal, or shall obstruct or divert from its channel any such sewer or watercourse, shall forfeit any sum not exceeding fifty pounds, nor less than forty shillings, and ten shillings for every day of continuation, such penalty to be recovered summarily in the manner provided for the recovery of penalties under these By-laws.

82. No person shall form, dig, or open any drain or sewer, in any public road or street, lane, or thoroughfare, or shall cut up the surface of any such road, street, lane, or thoroughfare, upon any pretence whatever, without leave in writing from the Mayor.

83. No person shall be allowed to throw rubbish, sweepings, or deposits of any kind, whatsoever, on the streets, pathways, or gutters of the Borough.

84. Any driver, carter, or other person who shall wilfully or negligently do, or suffer or cause to be done, any damage or injury to the kerbstones, gutters, or pathways of any street or roadway, or who shall drive a wheeled vehicle of any kind, or ride or drive, lead or stand, or permit to stand, any animal (other than dogs), on the pathway within the Municipality shall, upon conviction, forfeit and pay a sum not exceeding forty shillings, nor less than five shillings.

85. Any person who shall damage any public building, wall, parapet, bridge, road, street, sewer, watercourse, sluice, pump, fountain cock, waterpipe, shoot, embankment, or other public property in possession of the Council, shall be dealt with, as provided by the Municipalties Act of 1867.

86. Any person who shall wantonly or maliciously break or injure any lamp or lamp-post, or extinguish any lamp set up for public convenience in the said Municipality, shall, over and above the necessary expense of repairing the same or injury committed, forfeit and pay for every such offence any sum not less than one pound nor more than five pounds.

Throwing filth on carriage or foot ways.—Driving barrows and carriages on foot ways.

87. If any person shall, in any street or road, throw, cast, or lay, or shall cause, permit, or suffer to be thrown, cast, or laid, or to remain, any ashes, rubbish, offal, dung, soil, dead animals, blood, or any other filth or annoyance, or any matter or thing, in or upon the carriage-way or foot way of any such street or road, or shall kill, slaughter, dress, scald, or cut up, any beast, swine, calf, sheep, lamb, or other cattle, in or so near to any of the said streets or roads, as that any blood or filth shall run or flow upon or over, or to be on any such carriage-way or foot way, or shall run, roll, drive, draw, place, or cause, permit, or suffer to be run, rolled, driven, drawn, or placed upon any of the footways of any street or road, any waggon, cart, dray, sledge, or other carriage, or any wheelbarrow, or any truck or cask, or shall wilfully lead, or stand, or drive, or ride any horse or other beast, upon any of the footways aforesaid, every person so offending, upon conviction, shall forfeit and pay a sum not exceeding forty shillings, nor less than five shillings, for every such offence.

88. Nothing in these By-laws contained shall be deemed to prevent any person from placing an awning in front of his or her house or shop: Provided, however, that such awning be not less than seven feet above the height of the foot way in front of such house or shop, and that the posts be placed close up to the kerbstones or outer edge of such footway.

Suppression of nuisances and houses of ill-fame.

89. No householder or resident shall be permitted, under a penalty of any sum not exceeding ten pounds, to allow his or her premises, yards, closets, or drains, to be offensive or a nuisance to the neighbouring householders or residents.

90. No noisome or offensive trade shall be permitted, under a penalty of any sum not exceeding ten pounds, to be carried on in any premises, to the inconvenience or annoyance of the residents of neighbouring or adjoining houses or premises.

91. Upon representation by any respectable householder, that the house, premises, yards, closets, or drains of the neighbouring or adjoining premises are a nuisance, the Inspector of Nuisances, or any other person appointed by the Council, shall make an inspection of the premises complained of, and the officer of the Council shall have full power, without any other authority than this By-law, to go upon such premises for the aforesaid purpose, and if any such premises be found to be a nuisance, notice in writing shall be given to the proprietor or resident of such premises, that if, within seven days after the service of such notice, the nuisance shall not be removed, the proprietor, tenant, or occupant of the aforesaid premises shall, upon conviction, be liable to any penalty not exceeding twenty pounds.

92. For preserving the cleanliness of the said Borough, and the health of the inhabitants thereof, it shall be lawful for the Inspector of Nuisances, from time to time, and when as often as he or the Council shall see occasion to visit and inspect the butchers' shambles and slaughter-houses, and to give such directions concerning the cleansing of such shambles and slaughter-houses, both within and without, as to him or the said Council shall seem needful; and any butcher, and the owner or occupier of any such shambles or slaughter-houses, who shall obstruct or molest any such officer in the inspection thereof, or who shall refuse or neglect to comply with such directions within a reasonable time, shall, on conviction, on the complaint of any such officer, forfeit and pay any sum not exceeding forty shillings nor less than five shillings.

Swine, Horses, Goats, &c., not suffered to wander about the streets.

93. It shall not be lawful for any person whatsoever to suffer any kind of swine, or any horse, ass, mule, sheep, or goat, or other cattle belonging to him or her, or under his or her charge, to stray or go about, or to be tethered or depastured in any road, street, or public place; and any person who shall so offend shall forfeit and pay, in respect of every such animal, a sum not exceeding forty shillings.

Hog-styes and nuisances not removed on complaint.

94. In case any privy, hog-stye, boiling-down, or any other matter or thing (which shall, at any time or times hereafter be in any place within the said Municipality), shall be or become a nuisance, it shall be lawful for the said Council, upon any complaint thereof to them made by any of the inhabitants, and after due investigation of such complaint, by notice in writing, to order that such privy, hog-stye, boiling-down, or other matter or thing, being a nuisance, shall be remedied and removed within seven days after such notice shall have been given to the owner or occupant of the said premises wherein such nuisance shall exist, or shall have been left for such owner or occupier at his or her last or usual place of abode, or on the said premises; and every such owner or occupier neglecting to remedy or remove such nuisance, pursuant to such notice and to the satisfaction of the Council, shall, on conviction, forfeit and pay the sum of ten pounds for every such neglect or disobedience.

Swine not to be kept.

95. It shall not be lawful for any person whomsoever to breed, feed, or keep any kind of swine, in any house, building, yard, garden, or other hereditaments, situate and being in or within forty yards of any street or public place in the Municipality; and any person who shall so offend, shall, on conviction, forfeit and pay for every such offence any sum not exceeding forty shillings, nor less than five shillings.

Drawing or trailing timber.

96. If any person shall haul or draw, or cause to be hauled or drawn, upon any part of the streets, roads, or public places, any timber, stone, or other thing, otherwise than upon wheeled carriages, or shall suffer any timber, stone, or other thing, which shall be carried principally or in part upon wheeled carriages, to drag or trail upon any part of such streets or public places, to the injury thereof, every such person so offending shall, upon conviction, forfeit and pay for every such offence a sum not exceeding five pounds.

Wells to be covered over, &c.

97. Every person who shall have a well situated between his dwelling-house or the appurtenances thereof, and any road, street, or footway within the limits of the said Municipality, or at the side thereof, or in any yard or place open or exposed to such road, street, or footway, shall cause such well to be securely and permanently covered over; and if any person having such well as aforesaid, shall fail to cover and secure the same within twenty-four hours after notice in writing shall have been given to him or her by any officer of the said Council, or shall have been left for such person at his or her usual or last known place of abode, or on the said premises, shall, on conviction, forfeit and pay the sum of two shillings and sixpence for every such offence.

Enclosures around scaffolding.

98. If any person shall dig or make, or cause to be dug or made, any hole, or leave or cause to be left, any hole in or adjoining to any street, road, or public place, for the purpose of making any vault or vaults, or the foundation or foundations to any house or other building, or for any other purposes whatsoever, and shall not forthwith enclose the same in a good and sufficient manner, or shall keep up or cause to be kept up and continued, any such enclosure for any time which shall be longer than shall be reasonably required, or shall not, when thereunto required by the said Council or its officer, well and sufficiently fence or enclose any such hole within twenty-four hours after he shall be required to do so by the said Council or officer, and in the manner, and with such materials as they or he shall direct, and to their and his satisfaction, and shall not place a light upon the said enclosure, and keep the same constantly burning from sunset to sunrise during the continuance of such enclosure, or shall fail to place or erect a fence, rail, or boarding around any scaffolding or ladder that may be required during the repairs or erection of any building (such fence, rail, or boarding, not to extend beyond the footway of any street), or fail to keep, during the existence of such fence, rail, or boarding, a light burning from sunset to sunrise, at each corner of the same; then and in every case the person so offending shall, on conviction, forfeit and pay for every such offence, and for every such refusal or neglect, any sum not exceeding five pounds, nor less than forty shillings.

Erections, &c., in front of public streets, roads, &c.

99. No person shall build, erect, put up, or remove, or cause to be built, erected, put up, or removed, any building, house, shop, warehouse, wall, or fence, fronting any public street, road, or thoroughfare, unless he shall have previously given seven days' notice of his intention to commence such works, to the Mayor or the Council Clerk of the Municipality; and any person so offending shall, upon conviction, pay for every such offence any sum not less than ten shillings, nor more than forty shillings.

Interrupting free passage, &c., driving on wrong side of road, &c.

100. If the driver of any waggon, wain, cart, or dray of any kind, shall ride upon any such carriage in any street as aforesaid, not having some person on foot to guide the same (such carts as are drawn by one horse, and driven or guided with reins only, excepted), or if the driver of any carriage whatsoever, shall wilfully be at such distance from such carriage, or in such a situation whilst it shall be passing upon such street, that he cannot have the direction and government of the horse or horses, or cattle drawing the same; or if the driver of any waggon, cart, dray, or coach, or other carriage whatsoever, meeting any other carriage, shall not keep his waggon, cart, dray, or coach, or other carriage on the left or near side of the road, street, or thoroughfare; or if any person shall, in any manner, wilfully prevent any other person or persons from passing him or her, or any carriage under his or her care, upon such street, or, by negligence or misbehaviour prevent, hinder, or interrupt the free passage of any carriage or person in or upon the same, every such driver or person so offending, shall, upon conviction, forfeit and pay any sum not exceeding forty shillings, nor less than ten shillings.

Furious or careless driving, &c.

101. Any person who shall ride or drive through or upon any road, street, or public place, negligently, carelessly, or furiously, so as to endanger the life or limb of any person, or to the common danger of the passengers, shall, on conviction, forfeit and pay any sum not exceeding ten pounds, nor less than two pounds.

Affixing placards on walls, and chalking thereon.

102. It shall not be lawful for any person to paste, or otherwise affix any placard or other paper upon any wall, house, or building, by chalk or paint, or in any other manner, unless with the consent of the owner thereof; and any person who shall be guilty of any such offence, shall, on conviction, forfeit and pay a sum not exceeding ten shillings, nor less than two shillings and sixpence.

Carrying carcases of newly slaughtered meat.

103. Every person who shall carry or convey, or cause to be carried or conveyed, in any street or public place, the carcase, or any part of the carcase of any newly slaughtered animal, without a sufficient and proper cloth covering the same, for the concealment from public view, shall be liable, on conviction, to a penalty of any sum not exceeding forty shillings for every such offence.

Rain not to be carried on footways.

104. It shall not be lawful for any person whomsoever to carry by means of pipes, gutters, or other contrivances, any rain-water from the roof of his or her premises or house, nor permit nor suffer any rain-water to drop from the roof of his or her premises or houses upon any part of the footways of any street or public place within the Municipality; and any owner or occupier of any such house or premises, who shall neglect or refuse to remedy or remove any such pipes, gutters, or contrivances, when required to do so by any Municipal officer, shall, on conviction, forfeit and pay any sum not exceeding ten shillings, and a like sum for every day or part of a day that the same shall not be remedied or removed: prorovided that the owner or occupier of any such house or premises may convey any such rain-water by means of pipes laid under the surface of any such footways into the gutter adjoining the same; and provided also, that all such pipes shall be laid down to the satisfaction of, and under the superintendance of the Town Surveyor, or any other person appointed by the Council.

Breaking horses, &c.

105. It shall not be lawful for any person or persons in any street or public place within the Municipality, to drive any carriage or carriages for the purpose of breaking, exercising, or trying horses, or to ride, drive, or lead any horse, mare, or gelding, for the purposes of airing, exercising, trying breaking, showing, or exposing for sale, any such horse, mare, or gelding, otherwise than by passing quietly through such streets or public places: Provided further, that no person or persons shall be allowed within the said Municipality to furiously or carelessly drive any horse, mare, or gelding, to or from any public watering-place, creek, or river; and the person or persons in charge thereof, and who shall be *primâ facie* presumed to be the owner of the said animal or animals, and shall be liable accordingly; and every person so offending, upon conviction, shall forfeit and pay for every such offence any sum not exceeding forty shillings, nor less than five shillings.

Lights to be placed on vehicles.

106. Every person driving any vehicle within the Borough between sunset and sunrise shall carry a light on such vehicle in a conspicuous place. Any one offending against this By-law shall be liable to a penalty not exceeding ten shillings, nor less than two shillings and sixpence.

Names of owners on drays, &c.

107. The owner of every wain, waggon, van, cart, or dray plying for hire within, into, through, or from the Municipal District of South Singleton, shall have his name and place of abode painted in full length on the off side legibly, at least two inches high and proportionately broad, in white letters on black ground. Any one offending against the provisions of this By-law shall be liable to a penalty not exceeding ten shillings, nor less than two shillings and six-pence for each offence.

Hours for driving cattle.

108. Any person who shall drive or cause to be driven through any street, road, reserve, or public thoroughfare, or place of the said Municipality, any live stock, between the hours of 7 o'clock in the morning and 6 o'clock in the evening, except calves and foals under the age of one year, quiet milch cows, horses or cattle broken to saddle or draught, and pigs, sheep (not exceeding in number one hundred), and goats, shall forfeit and pay any sum not exceeding five pounds, nor less than one pound for every such offence, provided that this By-law shall not apply to any horses, cattle, sheep, or swine being driven the nearest route to the public pound, for the purpose of being impounded therein, or to the nearest public watering-place.

Driving and riding round street corners.

109. Any person who shall ride or drive round the corners of any street within the Municipality at a pace faster than a walk, shall, on conviction, forfeit and pay any sum not more than ten shillings, nor less than two shillings and sixpence.

Extirpation of noxious weeds.

110. Any owner or occupier of land within the said Municipal District who shall permit or suffer to grow, or remain on the said lands, the weeds known as the Bathurst Burr and Scotch Thistle, or other noisome weeds, and who shall fail to extirpate, remove, or destroy the same within ten days after the receipt of a notice in writing by post or otherwise from the Council so to do, shall for every such offence forfeit and pay a sum not exceeding five pounds, nor less than twenty shillings.

Bathing prohibited within certain limits.

111. Any person who shall bathe near to or within view from any inhabited house, or from any public bridge, street, road, or other place of public resort, within the limits of the said Municipal District between the hours of 6 o'clock in the morning and 8 o'clock in the evening, shall, on conviction, forfeit and pay for every such offence a sum not exceeding twenty shillings, unless in proper bathing costume.

Licensing public vehicles.

112. All water-carters, firewood carters, and owners of vehicles plying or carrying passengers, goods, or other materials for hire, shall be licensed by the Council, and the owners shall have their names painted in legible letters with the word "licensed" on some conspicuous part of such vehicles respectively. The license fee shall be at the rate of ten shillings per annum, and all such licenses shall be issued for a period of twelve months terminable on the thirty-first day of December in each year, and every owner who shall omit, or fail to comply with the provisions of this By-law, shall forfeit a sum not exceeding twenty shillings, nor less than five shillings.

Interpretation of Mayor and Municipality.

Whenever in any of these By-laws the word "Mayor" is made use of, unless the context shall indicate a contrary intention, it shall be construed also to signify and include any alderman lawfully acting for the time being in the place or stead of the Mayor; and whenever the words "Municipal District," or "Municipality" is made use of in the said By-laws, it shall be understood to signify the "Municipal District of South Singleton."

Passed by the Council of the Municipal District of South Singleton, this 14th day of July, 1885.

F. KING,
Mayor.

HARRY PINCHIN, Council Clerk.

[6d.] Sydney: Thomas Richards, Government Printer.—1886.

1885-6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF GRANVILLE—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 5th January, 1886.

BOROUGH OF GRANVILLE.—BY-LAWS.

THE following By-laws made by the Council of the Borough of Granville, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the Municipalities Act of 1867.

JOHN ROBERTSON.

BOROUGH OF GRANVILLE.

By-laws made by the Council of the Borough of Granville, under the Municipalities Act of 1867.

PART I.

Ordinary Meeting of Council.

1. Unless otherwise ordered, the Council shall meet for despatch of business on every alternate Wednesday, at the hour of 8 p.m., unless such day shall happen to be a public holiday. In the latter case the meeting shall be held on such day as the Mayor may appoint.

Election of Chairman in absence of Mayor.

2. If at any meeting of the Council the Mayor be absent at the expiration of fifteen minutes after the time appointed for holding such meeting, the Aldermen then present shall proceed to elect from among themselves a Chairman for such meeting.

Adjournment for want of quorum.

3. In the event of a quorum not being present at any meeting of the Council within half-an-hour after the time appointed for the holding of such meeting, the names of the Aldermen then present shall be entered in the minute-book by the Council Clerk, and the meeting shall lapse. Should it appear at any time during the holding of any meeting that there is not a quorum of members present, the Mayor shall have power to adjourn such meeting, or intended meeting, to some other time.

Order of Business.

4. The following shall be the order of business at all meetings of the Council other than special meetings:—

First. The minutes of the last preceding meeting to be read, corrected if erroneous, and signed by the Mayor or other Chairman. No discussion to be permitted on such minutes, except as to whether they are correct.

Second. Reports from Committees and minutes from the Mayor (if any) to be presented and orders made thereon.

Third. Correspondence to be read and orders made thereon if expedient.

Fourth. Petitions (if any) to be read and dealt with.

Fifth. Questions as to any matters under the jurisdiction or within the official cognizance of the Council to be put and replied to, and statements as to any facts, matters, or circumstances requiring attention by the Council, or any of the Committees or officers to be made, or any other special business, but shall not be debated.

Sixth. Orders of the day.

Seventh. Motions of which notice has been given to be dealt with in the order in which they stand on the business paper.

Special Meetings.

Business at special meetings.

5. At special meetings of the Council the business after the minutes shall have been read and confirmed shall be taken in such order as the Mayor or Aldermen at whose instance the special meeting shall be called may have directed.

Minutes, how confirmed.

6. The question for confirming the minutes shall be proposed and seconded immediately upon their being read, and shall be to the effect that the minutes now read be confirmed as a correct record of the proceedings, and no discussion shall be allowed thereon, except on the point of accuracy. Minutes of previous meetings to be read and verified at special meetings as at ordinary meetings.

Answers to questions.

7. It shall not be compulsory for the Mayor to give official replies to questions put to him, unless he shall have had twenty-four hours' notice thereof.

Business Paper, how prepared.

8. The business paper for every meeting of the Council shall be made up by the Council Clerk and delivered to the Mayor and Aldermen, or left at their respective residences, at least twenty-four hours before the time appointed for such meeting. The Council Clerk shall enter on such business paper a copy or the substance of every notice of motion and of every order referring to business proposed to be entertained at such meeting.

Notices of motion, &c., to be numbered as received and preserved until matter disposed of.

9. All notices of motion, &c., for consideration at general meetings shall be delivered to the Council Clerk at least four days before such meeting, in writing, and shall be numbered by him as they are received, and entered on the business paper according to their number, and each notice shall be preserved by such clerk until after the matter to which it relates shall have been disposed of: Provided, however, that the person giving or forwarding any such notice of motion, &c., shall be at liberty to withdraw the same at any time before the making up of the business paper.

Motion, &c., withdrawn or altered.

10. No notice of motion, &c., shall be withdrawn from the business paper, altered, or amended without leave having been first obtained from the Council.

Motion to rescind by call of Council.

11. No motion, the effect of which, if carried, would be to rescind any motion which has already passed the Council during the preceding twelve months shall be entertained unless a "Call of the whole Council" has been duly made and granted for that purpose, and no such motion shall be discussed until the previous resolution be rescinded.

How Business Paper is to be disposed of.

12. The business paper for each meeting of the Council shall, at such meeting, be laid before the Mayor or Chairman, who shall make a note upon such business paper of the mode in which each matter entered thereon has been dealt with. And such business paper so noted shall be a record of the Council.

Motions, how to be moved.

13. Except by leave of the Council, motions shall be moved in the order in which they stand in the business paper, and if not so moved or postponed shall be struck from such business paper and be considered to have lapsed.

Absence of proposed mover.

14. No motion, of which notice shall have been entered on the business paper, shall be proceeded with in the absence of the Alderman by whom such notice shall have been given, unless by some other Alderman producing a written authority for that purpose from such first-named Alderman.

Motions to be seconded.

15. No motion in Council shall be discussed unless and until it be seconded.

Members speaking.

16. No member shall speak on any motion or amendment longer than five minutes without the consent of the Council

Motion may be divided.

17. The Mayor shall have power to order a complicated question to be divided and put to the meeting separately.

Amount of vote to be included on Business Paper.

18. All notices of motion and orders of the day must include the amount proposed to be expended. No amendment shall propose to incur a greater expenditure than the original motion of which due notice has been given to the Aldermen, nor shall there be entertained any vote incidentally involving an expenditure without such notice.

Motion for adjournment.

19. No discussion shall be permitted on any motion for adjournment of the Council; and if, upon the question being put on any such motion, the same be negatived, the subject then under consideration, or the next in order on the business paper, or any other on such paper that may be allowed precedence, shall be disposed of before any subsequent motion for adjournment shall be in order.

Of what Orders of the Day shall consist.

20. The orders of the day shall consist of any matters (other than notices of motion) which the Council shall at a previous meeting thereof have directed to be taken into consideration, or which shall necessarily arise out of the proceedings of a former meeting, or which the Mayor or any Committee of the Council shall have directed to be entered on the business paper for consideration.

Amendment may be moved.

21. When a motion has been proposed and seconded, any Alderman shall be at liberty to move an amendment thereon, in writing, but no such amendment shall be discussed until it be seconded.

Amendments to be in writing.

22. All amendments must be in writing, signed by the mover and delivered to the clerk, who shall add thereto the name of the seconder. Any member, excepting the mover and seconder, having previously spoken to the original motion, shall not at this stage speak, but may do so on the amendment becoming the question before the Council.

Amendments, how disposed of.

23. Whenever an amendment is moved upon an original proposition, no second amendment shall be taken into consideration until the first amendment has been disposed of. If the first amendment be carried it shall displace the original question, and become itself the question, subject to any further amendment. If the first amendment be negatived, then a second amendment may be moved upon the original question under consideration; but only one amendment shall be submitted to the Council for discussion at one time.

Petitions.

Petitions to be respectfully worded.

24. It shall be incumbent on every Alderman presenting a petition, to acquaint himself with the contents thereof, and to ascertain that it does not contain language disrespectful to the Council. The nature and prayer of every such petition shall be stated to the Council by the Alderman presenting the same; and all petitions shall be received only as the petitions of the parties signing the same.

How Petitions are to be dealt with.

25. No motion shall, unless as hereinafter provided, be permissible on the presentation of a petition, except that the same be received, or that it be received and referred to a Committee; or that it be received, and that its consideration stand an order of the day for some future meeting: Provided, however, that if any Alderman shall have given due notice of motion in reference to any petition, and such petition shall have been presented before such Alderman shall have been called upon to move such motion, the said motion shall, if otherwise unobjectionable, be considered in order.

Reports from Committees.

Form of Report.

26. All reports from Committees shall be in writing, and signed by the Chairman of such Committee.

Mayor's minutes.

27. The Mayor shall have the right of directing the attention of the Council to any matter or subject within its jurisdiction, or official cognizance, by a minute in writing signed by himself.

How Reports, &c., are to be dealt with.

28. No motion shall be permissible on the presentation of a report from a Committee or a minute from the Mayor, except that the same be received, or that it be received, and that its consideration stand an order of the day for some future meeting: Provided, however, that if any Alderman shall have given due notice in reference to any such report or minute, or if an order for the consideration of such report or minute shall have been entered among the orders of the day, such motion or order may be moved or considered in due course.

Order of debate.

Mode of addressing the Council, &c.

29. Every Alderman who shall propose or second any motion, or shall propose or second any amendment, or shall take any part in any debate or discussion, or shall put or reply to any question, or shall make any statement, or shall in any other way, or for any other purpose, address observations to the Council, shall, while so doing, stand up in his customary place (unless he shall be prevented from so doing by reason of some bodily infirmity), and shall address himself to the Mayor or other Chairman then presiding: Provided that in the case of a question, such question may by permission of such Mayor or Chairman be put directly to the Alderman or officer to be questioned, and may be replied to in like manner; but in every such case the question so put and the answer thereto shall be subject to every legal objection on the ground of disorder or irrelevancy. And all members of the Council shall, on all occasions when in such Council, address and speak of each other by their official designations, as Mayor, Chairman, or Alderman, as the case may be.

Speaker not to be interrupted if in order.

30. No Alderman shall be interrupted while thus speaking, unless for the purpose of calling him to order, as hereinafter provided.

Speaker not to digress, &c.

31 No Alderman shall digress from the subject under discussion, or shall make personal reflections on, nor impute improper motives to, any other Alderman.

Mayor to decide as to pre-ordinance.

32. If two or more Aldermen rise to speak at the same time, the Mayor or Chairman shall decide which of such Aldermen shall be first heard.

Alderman may require question to be stated, &c., under certain restrictions.

33. Any Alderman may request the subject matter under discussion to be read or stated for his information, or may require the production of any records of the Council bearing upon such matter which are readily accessible: Provided, however, that no such request shall be so made as to interrupt any other Alderman when speaking or materially to interrupt the discussion: Provided also, that if any such request shall appear to the Mayor not to have been made *bonâ fide* it shall not be complied with.

Lapsed Business.

34. Whenever the consideration of any motion or matter of busines, shall have been interrupted by reason of a quorum not having been present, the consideration of such question shall in such case, be resumed at the point where it was so interrupted as aforesaid, at the next fortnightly meeting.

Previous Question.

35. On the previous question being moved and seconded, no debate shall be permited.

Questions of Order.

Mayor or Chairman to decide Points of Order.

36. The Mayor or Chairman shall preserve order, and his decision on disputed points of order or practice shall be final in that particular case; and the Mayor or Chairman may, without the interposition of any other member of the Council, call any Alderman to order, whenever, in the opinion of such Mayor or Chairman, there shall be a necessity for so doing; and every member of the Council shall have the right of calling the attention of the Mayor or Chairman to any motion, amendment, statement, argument, or observation moved, used, or made by any other member which such first-named member may consider out of order. And the Mayor or Chairman, when called upon to decide points of order or practice, shall state the provision, rule, or practice which he shall deem applicable to the case, without discussing or commenting upon the same.

Penalties for persisting in disorderly conduct.

37. Any member of the Council, either in Council or Committee, who shall have been called to order by the Mayor or Chairman, and who shall still persist in any line of conduct or argument which shall have been decided as aforesaid to be disorderly, and shall refuse to make such explanation retraction, or apology, as a majority of the Aldermen then present shall consider satisfactory, shall be liable on conviction for each offence, to a penalty of not less than one pound nor more than ten pounds.

Mode of Voting.

How Questions are to be put.

38. The Mayor or Chairman shall put to the Council all questions on which it shall be necessary that a vote be taken, and shall declare the sense of such Council thereon; and he shall be at liberty to put any such question as often as may be necessary to enable him to form and declare his opinion as to the decision of the majority of members present.

Division penalty for refusing to vote.

39. Any Alderman shall be at liberty to call for a division; in such case the question shall be put first in the affirmative and then in the negative, and the Aldermen shall vote by show of hands, and the names and votes of the Aldermen present shall be recorded. Any alderman present when a division is called for, and in any way refusing to vote on such division, shall be liable for every such offence to a penalty of not less than one pound nor more than five pounds.

Protests.

Mode of Protesting. Protest to be recorded.

40. Every member of the Council (the Mayor included) may protest against any resolution or vote by the Council; notice of the intention so to protest must however be given at the meeting when such resolution is passed or such vote is arrived at, and the protest itself must be handed or sent to the Council Clerk not later than seven days after such notice.

Special Powers of Mayor.

41. The Mayor shall exercise a general supervision over all officers and servants of the Corporation, and may order the preparation of any return or statement, or the giving of any explanation or information by any such officer or servant in connection with his duties as he may think necessary.

Usage of House of Parliament to be observed unless other provision made.

42. In all cases not herein provided for, resort shall be had to the rules, forms, and practice of the New South Wales Parliament, which shall be followed as far as they can be applied to the proceedings of this Council.

Calls of the Council.

How call may be made.

43. A call of the Council may be ordered by any resolution of which due notice shall have been given, for the consideration of any motion or matter of business before such Council.

Mode of proceeding.

44. The call shall be made immediately before the motion or business for which such call has been ordered shall be moved or considered. Such call shall be made as follows:—The Council Clerk shall call the names of all the members in their alphabetical order; each member present shall answer to his name so called; and if any members are absent, a record shall be made of such absence; but if leave of absence to any such member shall have previously been granted, or if such an excuse in writing shall have been forwarded to the Mayor or Council Clerk as a majority of the Council then present shall consider satisfactory, such absent member shall stand excused, and a record shall be made of such excuse, and of the reasons for the same.

Penalty for absence without legal excuse—Further call when question adjourned.

45. Any member of the Council who, having had notice of such call of the Council, shall not answer to his name as aforesaid, or who being absent shall not be legally excused as aforesaid, or who, if absent, and not so excused, shall fail to show that by reason of extreme illness or any other sufficient cause he has been unable to send an excuse in writing as aforesaid, or who having answered to his name as aforesaid, shall not be present when a vote is taken on the motion or business as to which such call has been made as aforesaid, shall, for every such offence, be liable to a penalty of not less than one pound nor more than five pounds: Provided that if the consideration of every such motion or matter of business be adjourned to a future day, there shall be a further call on the resumption of such consideration; and the provisions herein as to penalties for absence shall have reference to such further call: And if there shall be more than one adjournment, this proviso shall be taken to extend to the resumption of the consideration of such motion or matter of business after every such adjournment.

Standing and Special Committees.

Standing Committees.

46. There shall be seven Standing Committees, viz., Works or Improvement, Finance, By-laws, Lighting, Park, River, and General Purpose Committee. These Committees shall be re-appointed every year at the first meeting of the Council which shall be held after the election of the Mayor, and shall hold office until their successors are appointed.

Works or Improvement Committee.

47. The Works Committee shall consist of the whole Council, three to form a quorum, and shall have the general direction of all works ordered or sanctioned by the Council, and the general inspection of all streets, roads, ways, bridges, public reserves, and other public places under the care and management of the Council. They shall also inquire and report from time to time as to such improvements or repairs as they may think necessary, or as they may be directed by resolution of the Council to enquire into and report upon.

Finance Committee.

48. The Finance Committee shall consist of three Aldermen and the Mayor, two to form a quorum, and shall examine and check all accounts, and shall watch generally over the collection and expenditure of the Municipal Revenues. They shall enquire and report from time to time as to all matters which they may consider to affect, or to be likely to affect, the finances of the borough; and as to such matters or subjects of the like nature as they may be directed by resolution of the Council, to enquire into and report upon.

By-law Committee.

49. The By-law Committee shall consist of three Aldermen and the Mayor, two to form a quorum. It shall be their duty to prepare for the consideration of the Council drafts of all such by-laws as may be required. It shall be the duty of the By-law Committee to inspect the records from time to time to ascertain that the same are properly kept as aforesaid, and to report at once to the Council any act of neglect or appearance of inefficiency which they may discover in the keeping of such records. They shall also consider and report in due course upon any matter referred to them by the Council.

Lighting Committee.

50. The Lighting Committee shall consist of four Aldermen, two to form a quorum. It shall be their duty to carefully consider all matters referred to them by the Council from time to time in connection with or appertaining to the lighting of the borough, the supply of gas or otherwise under control, and such committee shall, without delay, report to the Council in writing with such recommendations as they may deem necessary.

Park Committee.

51. The Park Committee shall consist of four Aldermen, two to form a quorum. It shall be their duty to consider and report to the Council upon all matters in connection with the Parks, Reserves, or Recreation Grounds within this borough.

River Committee.

52. The River Committee shall consist of four Aldermen, two to form a quorum. It shall be their duty to consider and report upon all matters referred to them by the Council from time to time in connection with, or appertaining to, the Parramatta and Duck Rivers where they respectively adjoin the boundaries of this borough.

General Purposes Committee.

53. The General Purposes Committee shall consist of four Aldermen, two to form a quorum. It shall be their duty to take cognizance of every matter, subject, or question within the jurisdiction of the Council not coming within the province of one or other of the before-mentioned Standing Committees as they may be directed by resolution of the Council to enquire into and report upon.

Special Committees.

54. Special Committees may consist of any number of members, and may be appointed for the performance of any duty which may be lawfully entrusted to a Committee, and for which, in the opinion of the Council, a Special Committee ought to be appointed. And no Standing Committee shall interfere with the performance of any duty which may for the time being have been entrusted to any such Special Committee. The appointment of every such Special Committee shall be made by resolution, after due notice, and it shall be incumbent on the mover of such resolution to embody therein a statement of the duties proposed to be entrusted to such Special Committee. The mover of any such resolution may name therein such members as, in his opinion, ought to constitute such Committee, or he may propose that such Committee consist of a certain number of members.

Chairman of Committee.

55. Every Committee of which the Mayor shall not be a member shall elect a permanent Chairman of such Committee within seven days after their appointment.

Term of Service in Committee.

56. The appointment of every Special Committee shall be considered to endure until the duties for which such Committee have been appointed shall have been fully performed: Provided, however, that nothing herein contained shall be held to effect in any way the right of such Committee to remove any Chairman of such Committee, or to appoint another such Chairman in his stead.

Committee Meeting, how called.

57. The Council Clerk shall call a meeting of any Committee when requested so to do by the Chairman or any two members of such Committee, or the Chairman thereof may call a meeting if he shall think fit.

Records of transactions in Committee.

58. The Chairman of each Standing Committee shall make or cause to be made, in a book to be kept by him for that purpose, memoranda of all the transactions of such Committee, which book he shall, on ceasing to be such Chairman, hand over to his successor.

Reports to be recorded.

59. All reports of proceedings in Committee of the Whole Council shall be recorded in the minute-book.

60. No person, except a member of a Committee, shall be admitted at any meeting of such Committee, without the consent of the Chairman and the approval of the majority of members present.

Expenditure.

Except in emergent matters, cost of all works to be estimated before undertaken.

61. With the exception of emergent matters hereinafter specially provided for, no work affecting the funds of the borough shall be undertaken until the probable expense thereof shall have been first ascertained by the Council.

Emergent matters and necessary current expenses. Expenses authorized to be reported. Outlay to be in accord with orders of the Council.

62. For emergent matters and for necessary current expenses during the intervals which may elapse between the meetings of the Council, outlays to the following extent may be incurred:—

1. By order of the Works Committee, or of the Mayor and one member of such Committee,—for repairs or emergent works in one place to the extent of five pounds.
2. By order of the Mayor,—for necessary current expenses, the extent of two pounds.

Provided in every case a detailed report in writing of every such outlay shall be laid before the Council at its next meeting, such report to be signed by the Chairman of the Works Committee or the Mayor by whom such outlay shall have been authorized. Also, that such outlay shall only be permissible in reference to matters coming strictly within the jurisdiction or functions of the Council, and that no outlay involving a disobedience or evasion of any order or resolution of such Council shall on any pretence be thus authorized.

Estimate of expenditure.

63. No resolution, motion, or report involving the expenditure of Municipal funds exceeding in amount the sum of twenty-five pounds shall be adopted by the Council, unless an estimate of cost of the same shall have been previously made and submitted to the Council or a Committee by some responsible officer of the Council or other competent person, in either case duly appointed for that purpose.

All claims to be examined and reported upon by Finance Committee.

64. All accounts and demands of money against or from the Council shall be examined and reported on by the Special Committee for that purpose before any order shall be made for payment of such accounts or demands.

Certificate required with each claim.

65. No payment shall be ordered unless there shall be a certificate or memorandum from the Committee, Mayor, or officer of the Council to whom the direction or guardianship of such expenditure properly belongs, showing that the demand is a legitimate one, and has been duly authorized or inquired into. It shall be the imperative duty of the Finance Committee to see that this requirement is fulfilled before recommending payment: Provided that in cases of special expenditure under section 62 of this part of these by-laws, the report directed by that section to be laid before the Council shall, if the outlay shall have been lawfully incurred, be deemed a sufficient certificate.

Common Seal and Records of the Council.

Common Seal.

66. The common seal shall be in the custody and care of the Council Clerk, and shall not be attached to any document without an express order of the Council. In every case when such common seal has been ordered to be attached to any document, such document shall also be signed by the Mayor, or, in case of the absence or illness of such Mayor, by two Aldermen, and countersigned by the Council Clerk.

Records of the Council defined.

67. The minute-book, letter-book, and all rate and assessment books, books of account, records, statements and memoranda of receipts and expenditure, electoral rolls, and other records relating to elections, business papers, reports from Committees, minutes from the Mayor, petitions, letters on municipal business addressed to the Council, or to the Mayor, or to any officer or servant of the Council, orders, reports, returns, and memoranda relating to municipal business, drawings, maps, plans, contracts, specifications, agreements, and all other books and papers connected with the business of the Council, shall be deemed records of the Council.

Records not to be removed, &c.—Penalties.—Exceptional circumstances.—Receipt to be given in every case before document received.—Proviso as to use of records as matters of evidence.

68. Any person removing any book or other record of the Council as aforesaid from the Council Chamber, without leave for such removal having been first obtained from such Council, or without other lawful cause for such removal as hereinafter provided, shall for every such offence be liable to a penalty of not less than one pound nor more than ten pounds. And nothing herein contained shall be held to affect the further liability of any person who shall have removed such book or other record as aforesaid to prosecution for stealing such book or record, or to an action at law for detention of the same: Provided that leave for temporary removal of a book or other record may be granted to the Council Clerk or the Treasurer by the Mayor, in order that such Clerk or Treasurer may post up entries or perform any other duty which it may be necessary that he should perform; also that the Mayor, or the Chairman of any Committee, or any Alderman acting for any such Chairman, may temporarily remove any record necessary for the preparation of a minute or a report, or for the purposes of any prosecution or suit at law, by, against, or at the instance of the Council; but in all such cases such Clerk, Treasurer, Mayor, Chairman, or Alderman, as the case may be, shall give a receipt under his hand for every document so removed, and every such receipt shall be preserved among the records until the book or other record to which it refers shall have been returned; when such receipt shall be destroyed. And provided also that the Mayor, Council Clerk, or other officer of the Council, who may be subpœnaed to produce any book or other record of the Council in a Court of Law, shall have the right to remove such book or other record for the purpose of obeying such summons, but shall return such book or record as speedily as possible; and every such person so removing any book or other record of the Council as aforesaid shall be legally responsible for the safe keeping and return of the same.

Penalty for defacing or destroying record.

69. Any person destroying, defacing, or altering any record of the Council, shall, for every such offence, be liable to a penalty of not less than five shillings nor more than fifty pounds.

Officers and Servants.

Bonds for good conduct.

70. All bonds of officers or servants of the Council for the faithful performance of their duties, shall be deposited as the Council may order; and no officer or servant of the Council shall be received as surety for any other officer or servant.

Duties of Council Clerk.

71. The Council Clerk, in compliance with the Municipalities Act of 1867, or by the present or any other by-laws made thereunder, shall perform the following duties, viz.:—

1. Attend all Council Meetings.
2. Attend all Committee Meetings.
3. Attend all Courts of Revision and Appeal.
4. Summon the Members of the Council to all Council or Committee Meetings.
5. Take notes of all Minutes and prepare Reports of all Committees.
6. Conduct all Correspondence ordered by the Council, or under the direction of the Mayor, and give all other officers instructions as directed by the Minutes.
7. To see that the Accounts are audited and the balance sheet duly submitted twice a year within the times specified by law.
8. To see to the gazetting of all by-laws and necessary advertisements.
9. To see that the Assessment Books, and the Municipal Lists and Rolls are duly prepared; examine proofs of latter, and arrange for distribution of copies on payment, to electors, prior to the elections.
10. Make all necessary arrangements for the elections, preparing all papers, &c., for Presiding Officers and Poll Clerks.
11. Prepare all bonds of officers; see that the guarantees are given and agreements duly signed, &c., and report same to the Council.
12. Advise with the officers from time to time as to their duties and the mode of carrying them out.
13. See that all levels and names of streets have been duly advertised as provided for by law, and authenticated by the Mayor's signature.
14. To bring under the notice of the Mayor any matter or thing requiring his prompt attention.
15. He shall likewise have charge of all the records of the Council except such books or documents as may be entrusted to any other officer of the Council; and shall be responsible for the safe keeping of such records. He shall generally assist the Mayor in carrying out the orders of the Council.
16. He shall enter into a Guarantee Society's Security for an amount fixed by the Council from time to time for not less than £200 for the faithful performance of his duties.

Complaints against Officers, &c., how dealt with.

72. All complaints against officers or servants of the Corporation must be in writing, and must in every case be signed by the person or persons complaining; and no notice whatever shall be taken of any complaint which is not in writing or is anonymous. All such complaints may be addressed to the Mayor, who, immediately upon the receipt of any such complaint, and without laying the same before the Council, shall have power to investigate the same, and report thereon at the next meeting; or he may, if necessary, suspend such officer or servant till the Council shall have dealt with the charge.

Miscellaneous.

Leave of absence.

73. No leave of absence shall be granted to the Mayor or to any Alderman otherwise than by a resolution of the Council adopted after due notice.

Mode of calling for tenders.

74. Whenever it is decided that any work shall be executed or any materials supplied by contract, tenders for the execution of such work or the supply of such materials shall be called for by public notice.

How notices are to be published.

75. In all cases where public notice is or shall be required to be given by any by-law, such notice shall be given and published by advertising the same in some newspaper circulating in the borough.

Part II.

Collection and enforcement of rates.

Times and modes of collection.—Rates to be collected yearly.

1. All rates levied or imposed by the Council under the provisions of the Municipalities Act of 1867 and its amendments shall be levied and collected for the year and be due and payable on and after such days as the Council shall by resolution appoint at the time of making or imposing such rates.

Rates on damaged premises.

2. In the event of any premises being wholly or partially destroyed by fire or other accident, the Council shall have power to accept an equitable proportion of the assessed rates of such premises for the remainder of any municipal year.

Rates to be paid at office of Council Clerk.

3. All persons liable to pay any rates as aforesaid shall pay the amount thereof, within the time prescribed by the said resolution, into the office of the Council Clerk, during the office hours appointed by the Council.

Defaulters.

4. It shall be the duty of the Council Clerk to furnish the Mayor with a list of the names of all persons whose rates are unpaid at the expiration of the times fixed for payment of the same as aforesaid.

Mayor to enforce payment.

5. The Mayor shall issue distress warrants against all such persons, and cause such warrants to be enforced, or cause such defaulters to be sued for the amount of such rates in a Court of competent jurisdiction.

Enforcement by Distress.

Bailiff.

6. A Bailiff shall, when found necessary, be appointed by the Council, and the said Bailiff shall find two sureties to the satisfaction of the Council, to the extent of not less than twenty pounds each, for the faithful performance of his duties; and it shall be the duty of the Bailiff to make all levies, by distress, for the recovery of rates, in the manner hereinafter provided.

Warrant of Distress.

7. All levies and distresses shall be made under warrant in the form of Schedule A hereto, under the hand of the Mayor or any Alderman who may for the time being be duly authorized to perform the duties of that office.

Distress and sale, &c.

8. If the sum for which any such distress shall have been made shall not be paid with costs, as hereinafter provided, on or before the expiration of five days, the Bailiff shall cause to be sold the goods so distrained, or a sufficient portion thereof, by public auction, either on the premises or at such other place within the said borough as the Bailiff may think proper to remove them to for such purpose, and shall pay over the surplus (if any) that may remain after deducting the amount of the sum distrained for, and costs, as hereinafter provided, to the owner of the goods so sold, on demand of such surplus by such owner.

Inventory.

9. At the time of making a distress the Bailiff shall make out a written inventory in the form of Schedule B hereto, which inventory shall be delivered to the occupant of the land or premises, or the owner of the goods so distrained, or to some person on his or her behalf resident at the place where the distress shall be made; and in case there shall be no person at such place with whom such inventory can be left as aforesaid, then such inventory shall be posted on some conspicuous part of the land or premises on which the distress is made; and the Bailiff shall give a copy of the inventory to such person, on demand, at any time within one month after making such distress.

Goods may be impounded.

10. The Bailiff, on making a distress, as aforesaid, may impound or otherwise secure the goods or chattels so distrained, of what nature or kind soever, in such place or places, or in such part of the land or premises chargeable with rates as shall be most fit and convenient for this purpose; and it shall be lawful for any person whomsoever, after the expiration of five days, as hereinbefore mentioned, to come and go to and from such place or part of the said land or premises where such goods or chattels shall be impounded and secured as aforesaid, in order to view and buy, and in order to carry off and remove the same, on account of the purchaser thereof

Owner to direct order of sale.

11. The owner of any goods or chattels so distrained upon may at his or her option, direct and specify the order in which they shall be successively sold, and the said goods or chattels shall, in such case, be put up for sale according to such direction.

Proceeds of Distress.

12. The Bailiff shall hand over to the Council Clerk all proceeds of every such distress within forty-eight hours after having received the same.

Costs.

13. There shall be payable to the Bailiff, for the use of the Council, for every levy and distress made under these by-laws the costs and charges in the Schedule hereunto annexed marked C.

SCHEDULE A.

Warrant of Distress.

I, , Mayor of the Borough of Granville, do hereby authorize you, , the Bailiff of the said borough, to distrain the goods and chattels in the dwelling-house (*or in and upon the land and premises*) of , situate at , for , being the amount of rates due to the said borough to the day of , for the said dwelling-house (*or land or premises, as the case may be*), and to proceed thereon for the recovery of the said rates according to law.

Dated this day of , 18

Mayor.

SCHEDULE B.

Inventory.

I have this day, in virtue of the warrant under the hand of the Mayor of the Borough of Granville, dated , distrained the following goods and chattels in the dwelling-house (*or in and upon the land and premises*) of , situate at , within the said borough for , being the amount of rates due to the said borough to the day of

Dated this day of , 18

Bailiff.

SCHEDULE C.

Costs.

	s.	d.
For every warrant of distress	2	0
For serving every warrant and making levy	2	0
For making and furnishing copy of inventory	1	0
If in possession more than five hours, additional	5	0
And for every subsequent day, or part of a day, whilst in possession.....	5	0
For sale, commission, and delivery of goods, per pound on proceeds of the sale.....	1	0

PART III.

Preventing and extinguishing fires.

Fire or combustible materials, &c.

1. Every person who shall place, or knowingly permit to be placed, in any house, yard, or workshop, out-offices, or other premises, fire, gunpowder, or combustible, or inflammable material of any kind, in such a manner as to endanger contiguous buildings, shall, on conviction, for every such offence forfeit and pay a penalty of not more than five pounds; and shall forthwith remove such fire, gunpowder, or combustible, or inflammable materials. And every such person who shall suffer any such fire, gunpowder, or combustible, or inflammable materials to remain as aforesaid for twenty-four hours after any such conviction, shall be deemed guilty of a further offence against this By-law.

Inflammable fences, &c.

2. Every person who shall erect any fence of brushwood, bushes, or other inflammable material, or shall make or place any stack of hay, corn, straw, or other produce, or place as or for the covering of any such stack any inflammable material, so as to endanger contiguous buildings or properties, or any trees, shrubs, or other produce of such properties, or any chattels in or upon such buildings or properties, shall forfeit on conviction, for every such offence, a penalty of not more than five pounds, and also shall remove such fence, stack, or covering within a reasonable time after such conviction. And any person failing to remove such fence, stack, or covering within a reasonable time after any such conviction as aforesaid, shall be deemed guilty of a further offence against this by-law.

Discharging fireworks, firearms, &c.

3. Every person who shall light any bonfire, tar-barrel, combustible matter, or firework, or shall discharge any firearms upon or within sixty yards of any public or private street, or any public place, shall forfeit a sum not exceeding five pounds.

Wilfully setting fire to chimneys.

4. Every person who wilfully sets or causes to be set on fire any chimney flue, smoke-vent, or stove-pipe herein called in common a "chimney," shall forfeit a sum not exceeding five pounds.

PART IV.

Streets and public places—public health and decency, &c., streets, &c.

Plans of proposed new road, &c., to be deposited.

1. Whenever any proprietor or proprietors of land within the said borough shall open any road, street, way, park, or other place for public use or recreation, through or upon such land, and shall be desirous that the Council shall undertake the care and management of such road, street, way, or park, &c., he or they shall furnish the Council with a plan or plans, signed by himself or themselves, in the presence of a Magistrate, showing clearly the position and extent of such road, street, way, or park, and if the Council shall determine to take charge of any such road, way, or other place as aforesaid, the plan or plans so signed as aforesaid shall be preserved as a record or records of the Council, and the proprietor or proprietors aforesaid shall execute such further instrument dedicating such road, way, or other place to public use as may be considered necessary by the Council, and such further instrument of dedication shall also be preserved as a record of the Council; but the Council shall not be compelled to take charge of, or spend moneys on, or vote money for any new street, road, lane, or thoroughfare that is not forty feet wide, including pathway, and unless such street, road, lane, thoroughfare, or other place is first proclaimed and properly formed and completed to the satisfaction of the Council, at the expense of the owner or owners of the land through which such road, street, lane, thoroughfare, or other place is carried.

Sub-division of lands.

2. Any person or persons being desirous of sub-dividing any land into allotments, shall submit a plan to the Council for their approval, showing the extent of each such proposed sub-division and the provision for drainage, one month prior to disposal of the same being made. For neglecting to do so they shall be liable to a penalty of not less than £10 nor more than £50.

Erection of houses, &c.

3. No person shall be permitted to erect any fence, house, shop, or other building in any street, lane, or place within this borough, without first serving notice in writing on the Mayor or Council Clerk, stating such intention, and describing the proposed situation of the building or erection, and at the time the said notice is given pay to the Council Clerk a fee of five shillings (for permission to erect any house, fence, shop, or other building), and without having received an authority from the Mayor or Council Clerk. No person shall be at liberty to encroach beyond the building-line in any street or lane, by the erection of verandahs, overhanging balconies, doorsteps, fences, or any other obstruction whatever. Any person offending against this by-law shall be liable to a fine of ten shillings; and in the case of an encroachment, shall be liable to a further fine of not less than five shillings nor more than two pounds for every day that the same shall remain unremoved or unaltered, after receiving seven days' notice to that effect.

Works Committee to fix street levels, &c.

5. The Works Committee, or any officer or person acting under the supervision of such Committee shall, subject to such orders as shall from time to time be made by the Council in that behalf, fix and lay out the levels of all public roads, streets, and ways within the borough, and the carriage and footways thereof: Provided that there shall be no change of level in any such public road, street, or way, until the same shall have been submitted to, and adopted by, the Council, as hereinafter directed.

Change of street levels.

5. Whenever it may be deemed necessary to alter the level of any such public road, street, or way as aforesaid, the Works Committee shall cause a plan and section, showing the proposed alterations, to be exhibited at the Council Chambers for fourteen days, for the information and inspection of ratepayers, and shall notify, by advertisement in some newspaper circulating in the borough, that such plan is open to inspection. At a subsequent meeting of the Council the said plan and section shall, if adopted, be signed by the Mayor or Chairman, and countersigned by the Council Clerk. And such plan and section so signed and countersigned shall be a record of the Council.

Changes of street names.

6. The Council shall have power from time to time as they may deem expedient to alter the name of any street, road, lane, avenue, or other public place, situate within the borough, and so soon thereafter as may be convenient, shall cause a notification thereof to be inserted in the Government Gazette and one or more daily newspapers circulating within the Municipality.

No private sewers to be made to communicate with the public sewers without notice.

7. It shall not be lawful for any person, without permission from the Council, to make or branch any private drain or sewer into any of the public drains or sewers, or into any drain or sewer communicating therewith; and in case any person or persons shall make or branch any private drain or sewer into any of the said public drains or sewers, or into any drain or sewer communicating or to communicate therewith, without such notice, or otherwise than as aforesaid, every person so offending shall for every such offence on conviction forfeit and pay any sum not exceeding five pounds, and shall close such private drain under a further penalty of two pounds per week or part of a week so long as such private drain remains after such conviction.

Proprietors of private sewers, &c., to repair, cleanse same.

8. All drains or sewers communicating with any public drain or sewer shall from time to time be repaired and cleansed under the inspection and direction of the Council, at the costs and charges of the occupiers of the houses, buildings, lands, and premises to which the said private sewers or drains shall respectively belong; and in case any person shall neglect to repair and cleanse, or cause any such private drain or sewer to be repaired and cleansed, according to the direction of the said Council, he shall forfeit and pay for every such offence any sum not exceeding five pounds.

Drains for discharge of surface water from land.

9. Every owner or occupier of land in, adjoining to, or near any street, if such land shall be so situated that surface or storm water from or upon the same shall overflow or shall tend naturally, if not otherwise discharged, to overflow any footway of such street, shall within seven days next after the service of notice from the Council for that purpose, construct and lay a covered drain from such point upon such land being near to the footway, as shall be specified in such notice by plan appended or otherwise, and higher in level than the bottom of the channel at the outer edge of the footway to the said channel, and through, under, and transversely to the footway, and keep in good condition such covered drain, as and subject to the inspection of the Council or its proper officers; and in default of compliance with any such notice within the period aforesaid or with the provisions of this by-law, such owner or occupier shall forfeit any sum not exceeding five pounds nor less than ten shillings. And if after such conviction, such drain shall not be constructed as herein specified, or kept in good condition, such owner or occupier shall forfeit any sum not less than five shillings nor more than two pounds per day for each and every day after such conviction.

Houses, &c., to be spouted.

10. All proprietors of houses within the Municipality having a frontage to any street, shall be bound to have the same sufficiently spouted with down pipe, to be carried under the surface of the footpath into the gutter, under a penalty of ten shillings on conviction; and if not remedied at the expiration of seven days after such conviction, the offender shall be again liable to a like conviction and penalty also for every succeeding seven days.

No turf, gravel, &c., to be removed from streets without permission.

11. Any person who shall form, dig, or open any drain or sewer, or remove or cause to be removed any turf, clay, sand, soil, gravel, stone, or other material, in or from any part of the carriage or footway of any street, or other public place within the said borough, without leave first had and obtained from the Council, or who shall wantonly break up or otherwise damage any such carriage or footway, shall, on conviction, forfeit and pay for every such offence any sum not exceeding five pounds nor less than ten shillings.

Holes to be enclosed.

12. Any person or persons who shall dig or make, or cause to be dug or made any hole, or leave, or cause to be left, any hole, adjoining or near to any street or public place within the said borough, for the purpose of making any vault or the foundation to any house or other building, or for a well or any other purpose whatsoever, and shall not forthwith enclose the same and keep the same enclosed in a good and sufficient manner to the satisfaction of the Committee for Works of the said borough, on conviction shall forfeit and pay for every such refusal or neglect any sum not exceeding five pounds nor less than ten shillings.

Lights on obstructions, hoardings, &c.

13. Any person who shall have caused building materials, or hoarding enclosing such building materials, or any obstruction whatever to be placed on any portion of the footway or roadway in any street or streets of this borough, without having first obtained permission from the Council, and paid a fee of five shillings, and shall also keep the same properly lighted from sunset to sunrise, shall be liable to a penalty not exceeding five pounds nor less than one pound.

Temporary stoppage of traffic for repairs, &c.

14. The Committee for Works, or any officer or person acting under the authority of such Committee, may at any time cause the traffic of any street, lane, or thoroughfare, or any portion thereof, to be stopped for the purpose of repairing the same, or for any necessary purpose; and any person or persons offending against this by-law, either by travelling on such street, lane, or thoroughfare, or by removing or destroying any obstruction that may be placed thereon for the purpose of suspending the traffic, shall forfeit and pay a penalty of any sum not exceeding five pounds for every such offence.

Drawing or trailing timber, &c.

15. Any person who shall haul or draw, or cause to be hauled or drawn, upon any part of any street or public place within the said borough, any timber, stone, or other thing, otherwise than upon wheeled vehicles, or to drag or to trail upon any part of such street or public place, to the injury thereof, shall, upon conviction, forfeit and pay for every such offence a sum of not more than forty shillings nor less than five shillings over and above the damages occasioned thereby.

Throwing filth, &c., on footways, &c., killing animals.

16. Any person who shall throw, cast, or lay, or shall cause, permit, or suffer to be thrown, cast, or laid, or to remain, any ashes, rubbish, offal, dung, soil, dead animal, blood, slops, suds, or other filth or annoyance, or any matter or thing, in or upon the carriageway, footway, or water table of any street, lane or other public place in the said borough,—or shall kill any beast, swine, calf, sheep, lamb, or other animal, for the purpose of sale upon any premises, shall, on conviction, forfeit and pay a fine not less than forty shillings nor more than five pounds, and shall in addition to any such forfeiture pay the cost of removing such filth or obstruction or of restoring such water-course or canal into its proper channel.

Driving carriages, &c., on footways.

17. Any person who shall run, drive, draw, or cause, permit, or suffer to be run, driven, or drawn, upon any of the said footways of any such street or public place, any waggon, cart, dray, sledge, or other carriage, or any wheelbarrow, handbarrow, or truck, or any hogshead, cask, or barrel,—or shall wilfully lead, drive, or ride any horse, ass, mule, or other beast upon any such footway,—shall, upon conviction, forfeit and pay for the first offence a sum not exceeding forty shillings nor less than ten shillings, for the second offence a sum not exceeding five pounds nor less than one pound, and for a third and every subsequent offence a sum not exceeding ten pounds nor less than two pounds for each such offence.

Placing carriages, goods, &c., on footways, &c.—Not removing when required.—Replacing the same after removal.

18. Any person who shall set or place, or cause or permit to be set or placed, any stall-board, chopping-block, show-board (on hinges or otherwise), basket, wares, merchandise, casks, or goods of any kind whatsoever, in or upon or over any carriage or footway in any street or public place within the said borough—or shall place, or cause to be placed, any coach, cart, waggon, dray, wheelbarrow, handbarrow, sledge, truck, or other carriage upon any such carriageway or footway, except for the necessary time of loading or unloading, or taking up or setting down any fare, or waiting for passengers when actually hired, or harnessing or unharnessing the horses or other animals,—or if any person shall set or place, or cause to be placed, in or upon or over any such carriage or footway any timber, stones, bricks, lime, or other materials or things whatsoever,—or shall hang out or expose, or shall cause or permit to be hung out or exposed, any meat or offal, or other thing or matter whatsoever, from any house or other building or premises, over any part of any such footway or carriageway, or over any area of any house or other building or premises,—and shall not immediately and permanently remove all or any such matters or things, being thereto required by the Inspector of Nuisances or other proper officer of the Council,—shall, upon conviction for every such offence, forfeit and pay for the first offence a sum not exceeding forty shillings nor less than ten shillings, for the second offence a sum not exceeding five pounds nor less than one pound, and for a third and every subsequent offence a sum not exceeding ten pounds nor less than two pounds.

Obstructing public pathways.

19. If the owner or occupier of any land situate on the side of any street or road in this borough shall permit any tree, shrub, or plant, kept for ornament or otherwise, to overhang any footpath or footway on the side of any such street or road, and on demand made by the Council shall not cut, lop, or cause to be lopped, all such trees, shrubs, or plants to the height of eight feet at the least, the said Council, by their servants, labourers, and workmen, may cut or cause to be cut or lopped, at the expense of such owner or occupier, all such overhanging trees, plants, or shrubs, and to remove or burn any such trees, plants, or shrubs so cut or lopped, without being deemed a trespasser or trespassers; and in case any person or persons shall resist or in any manner forcibly oppose the said Council or their servants, labourers, or workmen in the due execution of the powers given in this behalf by virtue of the Municipalities Act of 1867, every person so offending shall, on conviction for every such offence, forfeit and pay any sum not exceeding ten pounds nor less than one pound.

Notices not to be painted on pavement.

20. Any person who shall stamp, stain, paint, write, or post any advertisement or notice upon any footway or kerbstone within this borough, shall be liable to a penalty not exceeding forty shillings.

Offensive or indecent placards.

21. Any person who shall in any street or place within this borough, post, expose to view, or distribute any placard, handbill, or other document whatever of an offensive or indecent character, shall be liable to a penalty not exceeding forty shillings.

Placards not to be fixed on walls, &c., without consent.

22. It shall not be lawful for any person to paste or otherwise affix any placard or other paper upon any wall, house, fence, or other erection, nor deface any such wall, house, fence, or erection, by chalk or paint, or in any other manner, unless with the consent of the owner thereof; and every person who shall be guilty of any such offence shall forfeit and pay a sum not exceeding twenty shillings nor less than ten shillings.

No rock to be blasted without notice to the Council Clerk.

23. Any person who shall be desirous of blasting any rock or earth, within fifty yards of any road, street, public place, or dwelling, shall give notice in writing twenty-four hours previously to the Council Clerk, who shall appoint a time when the same may take place, and give such other directions as he may deem necessary for the public safety, on payment of a fee of five shillings; and if any person shall blast, or cause to be blasted, any rock or earth within the limits aforesaid, without giving such notice, or shall not conform to the directions given to him by the Council Clerk, he shall on conviction forfeit and pay for every such offence any sum not less than one pound nor more than ten pounds.

Slop, night-soil, &c., to be conveyed away only at certain hours.

24. Any person or persons who shall drive, or cause to be driven, any cart or other carriage with any night-soil therein, through or in any street or public place within the said borough, between the hours of five o'clock in the morning and ten o'clock at night,—or shall fill any cart or other carriage so as to turn over or cast any night-soil, slop, mire, or channel-dirt, or filth, in or upon any such street or public place,—or shall deposit, or cause to be deposited, any night-soil or other offensive matter nearer to any street, road, or dwelling-house than shall be directed by the said Council or by the Inspector of Nuisances,—or shall remove night-soil or other offensive matter otherwise than in properly covered and water-tight carts or other vehicles,—or shall cause any vehicle used for this purpose to stand on any premises nearer to any road, street, or dwelling-house than shall be directed by the said Council or the said Inspector of Nuisances,—shall for every such offence forfeit and pay any sum not exceeding five pounds nor less than one pound; and in case the person so offending shall not be known to the said Council or Inspector, then the owner of such cart or carriage in which such night-soil or other offensive matter shall be put or placed, and also the employer of the person so offending shall be liable to and forfeit and pay such penalty as aforesaid.

Riding on drays, careless driving, &c.

25. If the driver of any vehicle whatsoever shall wilfully be at such a distance from such a vehicle, or in such a situation whilst it shall be passing upon any street or road that he cannot have the direction and government of the horse or horses, or by negligence or misbehaviour prevent, hinder, or interrupt the free passage of any other vehicle or person in or upon the said thoroughfare,—every such driver or person so offending shall, upon conviction, forfeit and pay any sum not exceeding forty shillings nor less than ten shillings.

Riding or driving furiously, &c.

26. Any person who shall ride or drive through or upon any street or public place within the said borough so negligently, carelessly, or furiously that the safety of any other person shall or may be endangered, shall, on conviction, forfeit and pay a sum not exceeding ten pounds nor less than one pound.

Injuring or extinguishing lamps.

27. Any person who shall wantonly or maliciously break or injure any lamp or lamp-post, or extinguish any lamp set up for public convenience in the said borough, shall, over and above the necessary expense of repairing the injury committed, forfeit and pay for every such offence any sum not less than one pound nor more than five pounds.

As to damaging buildings.

28. Any person who shall damage any public building, toll-gate, toll-bar, toll-board, wall, parapet, fence, sluice, bridge, culvert, sewer, watercourse or other public property within the said borough, shall pay the costs of repairing the same; and if such damage be wilfully done, shall forfeit and pay a sum not exceeding twenty pounds, nor less than one pound.

Persons not to stand or loiter in streets.

29. All persons standing or loitering upon any of the footways or other public places in this borough to the inconvenience of the passers by, or in any way interrupting the traffic, and shall not discontinue to do so on being requested by any officer or servant of the Municipal Council of this borough, or any police officer, shall, upon conviction, forfeit and pay a penalty not exceeding five pounds nor less than one pound.

Rubbish.

30. No kind of rubbish or offensive matter shall be thrown upon any public or private property within the borough without permission first obtained from the Municipal Council or the owner or owners of such property. Persons found guilty of a breach of this by-law shall forfeit and pay for every such offence any sum not exceeding two pounds nor less than ten shillings.

Nuisances.

Dead animals, &c., not to be thrown into any public watercourse, &c.

31. Any person who shall cast any filth, rubbish, or any dead animal, or any animal with intent of drowning, into any public watercourse, sewer, or waterhole—or who shall suffer slops, suds, or filth of any kind to flow from his or her premises into any such watercourse, sewer, or waterhole—or who shall permit or suffer any such slops, suds, or filth to flow from his or her premises over any of the footways or streets of the borough,—or shall permit or cause, by means of pipes, shoots, channels, or other contrivances, filth of any kind, whatsoever to flow into any public watercourse, gutter, or waterhole,—or shall obstruct or divert from its channel any sewer, watercourse, or creek,—shall, on conviction, forfeit any sum not exceeding five pounds nor less than one pound.

Swine not to be kept.

32. Any person who shall breed, feed, or keep any kind of swine in any house, building, yard, garden, or other hereditament situate and being in or within forty yards of any street or public place or any dwelling-house in the said borough, shall, on conviction, forfeit and pay for every such offence a sum not exceeding forty shillings nor less than ten shillings.

Cattle, &c., straying in the streets.

33. Any person who shall suffer any kind of swine, or any horse, ass, mule, sheep, goat, or other cattle belonging to him or her, or under his or her charge, to stray or go about, or to be tethered or depastured in any such street or public place, shall, on conviction, forfeit and pay for every such offence a sum not exceeding forty shillings nor less than ten shillings.

Stables, cow-sheds, and pig-styes.

34. The occupier of any land within this borough on which there shall be erected any stable, cow-yard, cattle-shed, or pig-sty, shall cause such premises to be kept in such a state, in respect to cleanliness, as not to be a nuisance or injurious to health, and shall cause all dung, soil, or manure produced or accumulated thereon to be collected in a place (to be approved of by the Inspector of Nuisances) in the yard of such premises, and there to be in an inoffensive condition, and so as not to be productive of any nuisance; and shall cause such dung, soil, or other manure to be, from time to time, removed from such premises, as often as the quantity so collected shall amount to two cubic yards. And if at any time the owner or occupier of any such premises shall neglect or fail to have such dung, soil, or other manure removed therefrom as aforesaid, the same shall be removed by the Inspector of Nuisances, at the expense of such occupier. For an offence against this by-law, any person shall be liable to a penalty of not less than one pound nor more than five pounds.

As to private avenues, &c.

35. Any owner occupier of any house, place, or land or within the borough, who shall neglect to keep clean all private avenues, passages, yards, and ways within the said premises, so as by such neglect to cause a nuisance by offensive smell or otherwise, or who shall allow stagnant water to become a nuisance on his land shall, on conviction, forfeit and pay a sum not exceeding forty shillings nor less than ten shillings for every such offence; and upon the reasonable complaint of any householder that the house, premises, yards, closets, or drains of the neighbouring or adjoining premises are a nuisance or offensive, the Inspector of Nuisances, or any person appointed by the Council, shall make an inspection of the premises complained of; and the officer of the Council shall have full power, without any other authority than this by-law, to go upon such premises for the aforesaid purpose.

Cleansing butchers' shambles, slaughter-houses, &c.

36. It shall be lawful for the Inspector of Nuisances, or for any other officer or officers appointed by the Council, as often as he shall see occasion, to visit and inspect the butchers' shambles, slaughter-houses, boiling-down establishments, tanneries, and fellmongering establishments or manufactories, in the borough, and to give such directions concerning the

cleansing the said shambles, slaughter-houses, tanneries, and establishments, both within and without, as to him shall seem needful; and any owner or occupier of any such shamble, slaughter-house, tannery, or establishment, who shall refuse or neglect to comply with such directions within a reasonable time, shall forfeit and pay a sum not exceeding ten pounds nor less than one pound.

Placing dead animals on premises.

37. Any person who shall place, or shall cause or suffer to be placed, upon any land or premises within the borough any dead animal, blood, offal, night-soil, or any other offensive matter so as to become a nuisance to the inhabitants thereof, shall, on conviction, suffer and pay a penalty not exceeding five pounds nor less than one pound for every such offence.

Deposit of rubbish, manure, &c.

38. No person shall deposit, or cause or suffer to be deposited in or by the side of, or on any road, street, right-of-way, lane passage, water-channel, or gutter, or in any creek, or in any other public place within the borough, any dust, mud, ashes, rubbish, filth, offal, manure, liquid manure, dung, or soil, and no person shall deposit, or cause or suffer to be deposited on any land, field, or garden within the borough, any night-soil, blood, offal, or other offensive matter or thing without the written consent of the Mayor or Council, and any such offensive matter or thing which shall with such consent of the said Mayor or Council be so deposited, shall be immediately on the deposit thereof covered over by the person depositing the same with such a quantity of earth as will at once prevent the escape of any noxious or offensive effluvium from any such manure, soil, or other offensive matter before mentioned: Provided that nothing contained in this by-law shall be construed or taken to prevent the use as manure, for any garden or land, of the contents of any earth-closet, or any other privy or closet where such contents are deposited on any such field or land in a perfectly deodorised state, and so as not to cause nuisance or offence, either at the time of the deposit of such contents or afterwards.

39. The Council shall have power to plant trees in the streets and public ways of this borough, and any person wilfully injuring or destroying any of such trees, or any railing or fence protecting the same, shall, on conviction, forfeit and pay a penalty of not more than ten pounds nor less than two pounds, in addition to the value of the tree, railing, or fence so injured or destroyed.

Damaging trees.

40. Any person who shall wilfully and without the authority of the Council, cut, break, bark, root up, or otherwise destroy or damage the whole or any part of any tree, sapling, shrub, or underwood, growing in or upon any street or place under the management of the Council, shall forfeit any sum not exceeding ten pounds nor less than one pound.

Allowing dead animals to remain on premises.

41. Any owner or occupier of any land or premises who shall suffer or permit any dead animal, blood, offal, night-soil, or any other offensive matter to remain upon the said land or premises after notice shall have been given to remove the same, shall be subject to a penalty not exceeding two pounds nor less than ten shillings for every day that the same shall so remain.

Various obstructions and annoyances.

42. Every person who, in any street or other public place or passage within the borough, to the obstruction, annoyance, or danger of the residents or passengers, shall commit any of the following offences, shall, on conviction, for any and every such offence, forfeit and pay a penalty of not more than two pounds nor less than ten shillings:—

(1.) Every person who shall hoist or cause to be hoisted or lower or cause to be lowered, goods of any description from any opening in any house, fronting any street or public place, and close to the footway thereof, without sufficient and proper ropes and tackling.

(2.) Every person who shall place any line, cord, or pole, across any street, lane, or passage, or hang or place clothes thereon to the danger or annoyance of any person.

(3.) Every person who shall place any flower-pot, box, or other thing in any upper window, near to any street or public place, without sufficiently guarding the same from being thrown out.

(4.) Every person who shall throw or cast from the roof or any part of any house or other building, any slate, brick, part of a brick, wood, rubbish or other material or thing (unless within a hoard or enclosure) when any house or building is being erected, pulled down, or repaired.

(5.) Every person who shall, within the distance of one hundred yards from any dwelling-house burn any rags, bones, cork, or any other offensive substance, to the annoyance of any inhabitant.

(6.) Every person who shall carry goods or any frame to the annoyance of any person upon the footway of any street or other public footway.

(7.) Every person who shall be the keeper of, or have any dog or other animal which shall attack or endanger the life or limb of any person who may have the right-of-way or use of any private yard, alley, street, or any other place within the borough.

Offences against public decency.

Bathing prohibited within certain limits.

43. Any person who shall bathe near to or within view of any inhabited house, or of any bridge, street, road, or other place of public resort within the limits of the borough, between the hours of six o'clock in the morning and eight in the evening, shall, on conviction, forfeit and pay a sum not exceeding one pound nor less than ten shillings for every such offence.

Part V.

Noisome and Offensive Trades.

No noisome or offensive trades to be carried on to injury of any inhabitants.

1. No person shall carry on any manufacture or trade, in the conducting or carrying on of which, or from the premises where the same is carried on, any gas, vapour, or effluvia, or any large quantities of smoke shall be evolved or discharged, which shall be calculated to injure animal or vegetable life, or in any other way to injure or be a nuisance to the inhabitants of the borough; and upon complaint in writing by any householder that any offensive trade is being so conducted or carried on in the vicinity of his or her residence or property as to injure his or her health, or the health of any member of his or her family, or be a nuisance to such householder,—the Inspector of Nuisances, or any other person or persons appointed by the Council, shall make an inspection of the premises where such trade is alleged to be so conducted or carried on as aforesaid, and of the premises or property of the complainant, and shall inquire into the grounds for such complaint, and shall report thereon to the Council. And if the Council shall, on the consideration of such report, or after any such further inquiry as may be deemed necessary, be of opinion that the said complaint is well founded, notice shall be given to the person or persons conducting, following, or carrying on such trade to cease and discontinue the same within such reasonable time as the Council may direct. And if such trade shall not be discontinued as aforesaid, or shall not be so conducted as that it shall wholly cease to be offensive within the time named in such notice as aforesaid, any person conducting or carrying on such trade as aforesaid shall, for the first offence, forfeit and pay a sum of not less than twenty shillings nor more than five pounds, for a second offence a sum of not less than two pounds nor more than twenty pounds, and for the third and every subsequent offence a sum of not less than five pounds nor more than fifty pounds.

Mode of proceeding when noisome and offensive trade is about to be commenced.

2. The like proceedings shall be taken as aforesaid whenever there shall be a complaint as aforesaid that any manufacture, trade, or operation is about to be commenced or entered upon, which is likely to prove offensive within the meaning of these by-laws save and except the notice to be given as aforesaid shall be given to the person or persons about to commence or enter upon such manufacture, trade, or operation, and shall require him, her, or them, not to commence or enter upon the same, or to take such measures as shall effectually and permanently prevent the same from becoming offensive, within the meaning of these by-laws, to any resident within the borough. And any person who shall in any such case commence, enter upon, or continue, any such manufacture, trade, or operation, so that the same shall be in any way offensive within the meaning of these by-laws, shall, for every such offence, forfeit and pay a sum of not less than two pounds nor more than twenty pounds.

Service of No-liabilities.

3. Service of any such notice as aforesaid upon the occupier or owner of any premises or land wherein or whereon any such manufacture, trade, or calling is being carried on, or is about to be commenced or entered upon, or at the last-known place of abode of such occupier or owner, or upon any person on the said premises or land, shall be a good and sufficient service of such notice for all the purposes of these by-laws. And every person who shall be actually engaged in superintending, directing, or managing, or who shall be in any other way actually engaged or employed in any such manufacture, trade, or operation as aforesaid, shall be liable to be regarded and treated as a person conducting, following, or carrying on such manufacture, trade, or operation, within the meaning and for all the purposes of these by-laws.

Damming up without consent.

4. Whosoever shall, without the consent in writing of the Council, construct or place any dam or embankment in or across any creek or natural watercourse, shall forfeit and pay any sum not less than one pound nor more than twenty pounds, and shall remove such dam or embankment within a reasonable time after such conviction, or shall forfeit and pay any sum not less than five pounds nor more than fifty pounds. And if after such second conviction such person shall fail to remove such dam or embankment within a further reasonable time, he shall forfeit and pay a sum of not less than twenty pounds nor more than fifty pounds; and if within a reasonable time after a third or any further conviction he shall still fail to remove such dam or embankment, he shall for every such offence forfeit and pay a sum of fifty pounds.

Disposal of sewage, &c.

5. The Council shall have power from time to time to enforce the adoption or alteration of any system, which to them may appear necessary, for the better regulation, disposal, or treatment of night-soil, sewerage, or other drainage, and may suspend the use or further extension of any system which to them may seem detrimental to public health. Any person refusing to comply with any requisition made under this by-law after receiving notice from the Council or an officer under them, shall forfeit a sum not exceeding five pounds nor less than one pound for each offence.

Making By-laws.

6. No by-law shall be passed until it has been reported upon by the By-law Committee.

Made and passed by the Municipal Council of the Borough of Granville, this 27th day of May, A.D. 1885.

(L.S.) JOHN NOBBS,
Mayor.

JOHN S. BEACH,
Council Clerk.

Sydney: Thomas Richards, Government Printer.—1886.

[9d.]

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF NARRANDERA—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 153.

Colonial Secretary's Office,
Sydney, 23rd December, 1885.

BOROUGH OF NARRANDERA.—BY-LAWS.

THE following By-laws, made by the Council of the Borough of Narrandera, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the Municipalities Act of 1867.

JOHN ROBERTSON.

BY-LAWS OF THE BOROUGH OF NARRANDERA.

THE following By-laws, made by the Borough Council of Narrandera, for regulating the proceedings of the Council, and the duties of the officers and the servants of such Council; for preserving order at meetings of said Council; for determining the times and modes of collecting and enforcing payment of rates; for preventing and extinguishing fires; for suppression of nuisances and houses of ill-fame; for preventing or regulating and licensing exhibitions held or kept for hire or profit, bowling or skittle-alleys and other places of amusement; compelling residents to keep their premises free from offensive or unwholesome matters; opening new public roads, streets, ways, and reserves; for protection of public fountains and water-courses; aligning and cleansing roads and streets; for regulating the supply and distribution of water, sewerage, and drainage; for regulating the blasting of any rock or rocks, preventing trees from overhanging public pathways, and preserving trees, shrubs, and other public property, to extirpate weeds; for preventing or regulating the bathing or washing the person in any public water near a public thoroughfare; for preserving public decency; for providing for the health of the Municipality, and for the prevention of contagious or infectious diseases; for restraining noisome trades; and generally for maintaining the good rule and government of the said Municipality.

PART I.

Meetings of the Council.

Ordinary Meetings.

1. The Council shall meet for the despatch of business at the hour of 7·30 p.m. every alternate Wednesday, unless such day shall happen to be a public holiday. In the latter case the meeting shall be held on such other day as the Mayor or the Council may appoint.

Election of Chairman in absence of Mayor. Adjournment for want of a quorum.

2. If at any meeting of the Council the Mayor be absent at the expiration of fifteen minutes after the time appointed for holding such meeting, the Aldermen then present shall proceed to elect from among themselves a Chairman for such meeting, to give place to the Mayor if he should arrive at any later hour during the meeting. Whenever there shall be an adjournment of any such meeting for want of a quorum the names of the members present shall be taken down, and shall be recorded in the Minute-book.

Order of Business.

Business of Ordinary Meetings.

3. The following shall be the order of business at all meetings of the Council other than special meetings:—

1. The minutes of the last preceding meeting to be read, corrected if erroneous, and verified by the signature of the Mayor or other Chairman. No discussion to be permitted on such minutes except as to whether they are correct.
2. Correspondence to be read, and, if necessary, ordered upon.
3. Petitions (if any) to be presented and dealt with.
4. Reports from Committees, and minutes from the Mayor (if any) to be presented and ordered upon.
5. Questions as to any matters under the jurisdiction or within the official cognizance of the Council to be put and replied to; and statements as to any facts, matters, or circumstances requiring attention by the Council or any of its Committees or officers, to be made.
6. Motions of which notices have been given to be dealt with in the order in which they stand on the business-paper.
7. Orders of the day to be disposed of as they stand on the business-paper; but it shall be competent to the Council at any time, by resolution without notice, to entertain any particular motion, or to deal with any particular matter of business out of its regular order on the business-paper without any formal suspension of this section; also, in like manner to direct that any particular motion or matter of business shall have precedence at a future meeting.

Business at Special Meetings.

4. At special meetings of the Council the business, after the minutes have been read and verified, which shall be done in the same manner as at an ordinary meeting, shall be taken in such order as the Mayor or the Aldermen, at whose instance such special meeting shall have been called, may have directed.

Business-paper for Ordinary Meetings.

5. The business-paper for every meeting of the Council, other than a special meeting, shall be made up by the Town Clerk or other person acting as his substitute, not less than forty-eight hours, and not more than three days before the day appointed for such meeting; he shall enter upon such business-paper a copy or the substance of every notice of motion, and of every requisition or order as to the business proposed to be transacted at such meeting which he shall have received or shall have been required or directed so to enter in due course of law and as hereinafter provided; every such entry shall be made subject to the provisions of section 3 of this Part of these By-laws in the same order as such notice, requisition, or direction shall have been received.

Business-paper for Special Meetings.

6. The business-paper for each special meeting shall contain only such matters as shall have been specially ordered to be entered thereon by the Mayor or Aldermen calling such meeting.

Summons to members.

7. The summons to members of the Council, of every meeting thereof, shall be prepared from the business-paper for such meeting, and shall embody the substance of such business-paper.

How business-paper is to be disposed of.

8. The business-paper for each meeting of the Council, shall at such meeting be laid before the Mayor or Chairman, who shall cause a note to be made upon such business-paper of the mode in which each matter entered thereon has been dealt with, and such business-paper so noted shall be a record of the Council.

All notices of motion to be numbered.

9. All notices of motion, and all requisitions from Aldermen, and directions from the Mayor, as to the entry of any particular matter of business for the consideration of the Council, at its then next or any further meeting, shall be numbered by the Council Clerk as they are received; and each such notice, requisition, and direction shall be preserved by such Clerk until after the matter to which it relates shall have been disposed of, and the record in the minute-book of the manner in which such matter has been so disposed of shall have been duly verified, as required by section 3 of this Part of these By-laws; provided, however, that the person giving or forwarding any such notice of motion, requisition, or direction to the Council Clerk, shall be at liberty to withdraw the same at any time before the making up of the business-paper.

After business-paper made up, all notices, &c., to be the property of the Council.

10. After the business-paper shall have been made up, as aforesaid, all the said notices of motion, requisitions, and directions as to which entries have been made thereon, shall be property of the Council, and shall not be withdrawn, altered, or amended without leave having been first obtained from the Council for such withdrawal, alteration, or amendment.

Motions and Amendments.

Motions—how to be moved.

11. Except by leave of the Council, motions shall be moved in the order in which they stand on the business-paper, and if not so moved or postponed shall be struck from such business-paper, and be considered to have lapsed.

Absence of proposed mover.

12. No motion of which notice shall have been entered on the business-paper shall, except as hereinafter provided, be proceeded with in the absence of the Alderman by whom such notice shall have been given, unless by some other Alderman producing a written authority for that purpose from such first-named Alderman.

Motion to be seconded.

13. No motion in Council shall be discussed unless and until it be seconded.

Amendments may be moved.

14. When a motion in Council shall have been made and seconded any Alderman shall be at liberty to move an amendment thereon, but no such amendment shall be discussed until it shall have been seconded.

Motions and amendments to be in writing.

15. No motion or amendment shall be discussed until it shall have been reduced into writing.

Only one amendment at a time.

16. No second or subsequent amendment shall be taken into consideration until the previous amendment or amendments shall have been disposed of.

Amended question—further amendment may be moved thereon.

17. If any amendment be carried, the question as amended thereby shall itself become the question before the Council, whereupon any further amendment upon such question may be moved.

How subsequent amendments may be moved.

18. If any amendment either upon an original question, or upon any question amended as aforesaid, shall be negatived, then a further amendment may be moved to the question to which such first-mentioned amendment was moved, and so on; provided that not more than one question and one proposed amendment thereof shall be before the Council at any one time.

Motions for adjournment.

19. No discussion shall be permitted on any motion for adjournment of the Council, and if upon the question being put on any such motion, the same being negatived, the subject then under consideration, or the next in order on the business-paper, or any other on such paper, they may be allowed precedence, shall be discussed before any subsequent motion for adjournment shall be receivable.

Requisitions from Aldermen, how to be dealt with.

20. Every requisition by an Alderman that any particular matter of business be brought before the Council, shall be regarded and treated as a notice of motion by such Alderman that such business be taken into consideration by the Council, and he shall be called upon in due order to move that such business be so considered, or to make any other motion which he may think fit in reference thereto which shall be consistent with the notice of such business and with good order; and if such Alderman be absent, or if being present, and so called upon, he shall make no such motion, then it shall be open for any other Alderman to make such motion; and when any such motion shall have been made, it shall be dealt with in precisely the same manner as if notice thereof had been given, subject, however, to any objection which may exist as to its not being in accordance with the notice actually given of such business or with good order. And if no motion shall be made in reference to such business, the entry relating thereto shall be struck from the business-paper.

Orders of the day—of what they shall consist.

21. The orders of the day shall consist of any matters other than motions on notice which the Council shall at a previous meeting thereof have directed to be taken into consideration, or which the Mayor or any Committee of the Council shall have directed to be entered on the business-paper for consideration.

How they are to be dealt with.

22. Section 20 of this Part of these By-laws shall be considered applicable to orders of the day; and the Alderman who has the usual charge of, or who has previously moved in reference to the particular business to which any such order of the day relates, shall be the person called upon to move; provided that as to any order of the day entered as aforesaid by direction of the Mayor or Chairman, such Mayor may arrange with any Alderman to move, and may in such case call upon the Alderman with whom he has so arranged.

Petitions—to be respectfully worded.

23. It shall be incumbent upon every Alderman presenting a petition to acquaint himself with the contents thereof, and to ascertain that it does not contain language disrespectful to the Council; the nature and prayer of every such petition shall be stated to the Council by the Alderman presenting the same.

Petitions—how received.

24. All petitions shall be received only as the petitions of the parties signing the same.

How Petitions are to be dealt with.

25. No motion shall, unless as hereinafter provided, be permissible on the presentation of a petition except that the same be received, or that it be received and referred to one of the Permanent Committees hereinafter mentioned, or that it be received and that its consideration stand an order of the day for some future meeting: Provided, however, that if any Alderman shall have given due notice of a motion in reference to any petition, and such petition shall have been presented before such Alderman shall have been called upon to move such motion, the said motion shall, if otherwise unobjectionable, be considered in order.

Correspondence.

Duties of Mayor as to correspondence.

26. The Mayor shall have the same duty in reference to letters addressed to the Council, before directing the same to be read, as by section 25 of this Part of these By-Laws is imposed upon Aldermen presenting petitions; the Mayor shall

direct as to order in which all correspondence shall be read, and no letter addressed to the Council shall be presented or read by any Alderman If the Mayor be absent and shall not have examined any such letters addressed to the Council, or have given any such directions as aforesaid, then the duties imposed by this section shall devolve upon the presiding Alderman.

Section 25 to apply to letters.

27. Section 25 of this Part of these By-Laws shall be considered as fully applicable to letters addressed to the Council as to petitions.

Letters sent not to be discussed, but every letter may be subject of motion.

28. No discussion shall be permitted in reference to any letters which may have been written and sent by the Mayor or by any Officer of the Council, and copies of which may be read to such Council. Provided, however, that any notice of motion consistent with good order may be entertained with reference to any such letters whether read or not, or with reference to any letters addressed to the Council which the Mayor or presiding Alderman may not have ordered to be read as aforesaid.

Reports from Committees and Minutes from the Mayor.

Form of Report

29. All reports from Committees shall be written on foolscap paper, with a margin of at least one-fourth of the width of such paper, and shall be signed by the Chairman of such Committee, or in his absence by some other member of the same.

Mayor's Minute

30. The Mayor shall have the right of directing the attention of the Council to any matter or subject within its jurisdiction or official cognizance, by a minute in writing. Every such minute shall be written on paper of the same kind and with the same margin as a report from a Committee, and shall be signed by such Mayor.

How Reports, &c., are to be dealt with; duties of Chairman, &c., in certain cases.

31. No motion shall (unless as hereinafter provided) be permissible on the presentation of a report from a Committee, or a minute from the Mayor, except that the same be received, or that it be received, and that its consideration stand an order of the day for some future meeting; provided, however, that if any Alderman shall have given due notice in reference to any such report or minute, or if an order for the consideration of such report or minute shall have been entered among the orders of the day, such motion or order may, if otherwise unobjectionable, be moved or considered in due course; and whenever any such report or minute embodies any recommendation which cannot legally be carried out without any due notice, and it is nevertheless desirable that such report or minute shall be definitely ordered upon during the meeting of the Council at which such report or minute is presented, it shall be the duty of the Chairman or member of such Committee signing such report, or of such Mayor, as the case may be, to give or transmit to the Council Clerk such a notice of motion, requisition, or direction as aforesaid as will enable such Council Clerk to make the necessary entry on the business-paper and to give such due notice.

Questions and Statements.

Limitations as to Questions and Statements.

32. No question or statement shall be allowed to be put or made which is inconsistent with good order or is not in strict accordance with the requirements of section 3 of this Part of these By-laws.

Notice to be given.

33. Sufficient notice of every question shall be given to the person who is expected to reply thereto to allow for the consideration of such reply, and, if necessary, for a reference to other persons or to documents.

Answer not compulsory.

34. It shall not be compulsory upon any person questioned as aforesaid to answer the question so put to him.

Questions to be put without argument, &c.

35. Every such question must be put categorically without any argument or statement or fact.

Similar provision as to statements.

36. Every such statement must be made without argument.

No discussion on questions, &c.—Rights of objection and of subsequent motion reserved.

37. No discussion shall be permitted as to any such questions, or as to any reply or refusal to reply thereto, or as to any such statement, at the time when such question is put or such reply or refusal to reply is given or such statement is made. Provided, however, that nothing herein contained shall prevent the taking of any objection as to any question or statement being out of order, or shall prevent the discussion, as due notice as hereinbefore provided of any matters properly arising out of or relating to any such question or reply, or refusal to reply, or any such statement as aforesaid.

Order of Debate.

Mode of addressing the Council, &c.

38. Every Alderman who shall make or second any motion, or shall propose or second any amendment, or shall take any part in any debate or discussion, or shall put or reply to any question, or shall make any statement, or shall in any other way or for any other purpose address observations to the Council, shall, while so doing, stand up in his customary place (unless he shall be prevented from so doing by reason of some bodily infirmity) and shall address himself to the Mayor or other Chairman then presiding. Provided that in the case of a question such question may by permission of such Mayor or Chairman be put directly to the Alderman or officer to be questioned, and may be replied to in like manner; but in every such case the question so put and the reply thereto shall be subject to every legal objection on the ground of disorder or irrelevancy; and all members of the Council shall on all occasions, when in such Council, address and speak of each other by their official designations, as Mayor, Chairman, or Alderman as the case may be.

Speaker not to be interrupted if in order.

39. No Alderman shall be interrupted while thus speaking unless for the purpose of calling him to order as hereinafter provided, and any Alderman using, whilst in the Council, any offensive or insulting language, the same to be written down, and on being asked to withdraw, and if any Alderman shall refuse to withdraw such language and apologise he shall be deemed guilty of misconduct, and be liable to a fine of not less than twenty shillings nor more than five pounds.

Limitation as to number of speeches, &c.

40. Every mover of an original motion shall have a right of general reply to all observations which may have been made in reference to such motion and to any amendments moved thereon, as well as a right to speak upon every such amendment. Every Alderman, other than the mover of such original motion, shall have a right to speak once upon such motion and on every amendment thereon; no Alderman shall speak oftener than once upon any question other than a question of order, unless when misrepresented or misunderstood, in which case he shall be permitted to explain without adding any further observations than may be necessary for the purposes of such explanation.

Mover and seconder.

41. An Alderman who has moved any motion or amendment shall be considered to have spoken thereon, but an Alderman who shall have seconded any such motion or amendment without any further observation than that he seconded the same shall be at liberty to speak on such motion or amendment.

Speaker not to digress, &c.

42. No Alderman shall digress upon the subject under discussion, or shall make personal reflections on or impute improper motives to any other Alderman.

Adjournment of debate,

43. A debate may be adjourned to a later hour of the day, or to any other day specified, and the Alderman upon whose motion such debate shall have been so adjourned shall be entitled to pre-audience on the resumption of the same.

Mayor to decide as to pre-audience.

44. If two or more Aldermen rise to speak at the one time, the Mayor or Chairman shall decide which of such Aldermen shall be heard first.

Alderman may require questions to be stated, &c., under certain restrictions.

45. Any Alderman may request the question or matter under discussion to be read or stated for his information, or may require the production of any records of the Council bearing upon such question or matter which are readily accessible, provided however that no such request or requisition shall be so made as to interrupt any other Alderman when speaking, or materially to interrupt the discussion; also, that if any such request or requisition shall appear to the Mayor or Chairman not to have been made *bona fide*, it shall not be complied with.

Mayor or Chairman not to move or second motion, &c., but may address Council thereon.

46. The Mayor or Chairman shall not move or second any motion or amendment, or put any questions, as provided for by section 4 of this Part of these By-laws, except as is further provided for by the section 38 of the same; but such Mayor or Chairman shall have the same right as any other Alderman to speak once upon every such subject or amendment. The Mayor or Chairman shall rise when so speaking (unless prevented by some bodily infirmity from so doing), but shall be considered as still presiding.

Questions of Order.

Mayor or Chairman to decide points of order.

47. The Mayor or Chairman shall preserve order, and his decision on disputed points of order or practice shall be final, except in so far as the same may be questioned as in the manner hereinafter provided.

Acts of disorder.

48. Every member of the Council who shall commit a breach of any section of this Part of these By-laws, or who shall move or attempt to move any motion of amendment embodying any matter as to which the Council has no legal jurisdiction, or who shall in any way raise or attempt any question, or shall address or attempt to address the Council upon any subject which the said Council has no legal right to entertain or to discuss, or who shall use any other language which according to the common usage of gentlemen would be held disorderly, or who shall say or do anything calculated to bring the Council into contempt, shall be out of order.

Mayor, &c, may call member to order.

49. The Mayor or Chairman may, without the interposition of any other member of the Council, call any Alderman to order whenever, in the opinion of such Mayor or Chairman, there shall be a necessity for so doing.

Any member may raise question of order.

50. Every member of the Council shall have the right of calling the attention of the Mayor or Chairman to any motion, amendment, statement, argument, or observation moved, used, or made by any other member, which such first-mentioned member may consider out of order.

Mode of proceeding thereon.

51. A member called to order shall withdraw while the question of order is being discussed and decided upon, unless specially permitted to offer an explanation, retraction, or apology; but on obtaining such special permission, such member may explain, retract, or apologise for the matter or remark alleged to have been out of order; and if such explanation, retraction, or apology be deemed satisfactory, no further discussion on the question of order shall be permitted. If any member, on being called to order, shall ask such permission to explain, retract, or apologise as aforesaid, the Mayor or Chairman may, of his own authority, grant or refuse such permission as he may think fit, unless any member shall require the sense of the Council to be taken on this question; in such case it shall be the duty of the Mayor or Chairman to take the sense of the Council at once, and without discussion, as to whether such permission shall be granted; and when any such explanation, retraction, or apology is considered sufficient, if such permission be refused, or if such explanation, retraction, or apology be deemed insufficient, the question of order shall be considered and decided before any further business is decided upon: Provided that if such Mayor or Chairman shall have decided the question of order before any member shall have required the sense of the Council to be taken in reference thereto, such question of order shall not be reopened; and provided further that nothing herein contained shall be held to affect the right of such Mayor or Chairman to decide finally, as hereinbefore provided, upon any such point of order after the same shall have been discussed.

Decision of points of order.

52. The Mayor or Chairman when called upon to decide points of order or practice, shall state the provision, rule, or practice which he shall deem applicable to the case, without discussing or commenting upon the same.

Motions out of order to be rejected—Members to explain, retract, or apologise, &c.

53. Whenever it shall have been decided as aforesaid that any motion, amendment, or other matter before the Council is out of order, the same shall be directed; and whenever anything said or done in Council by any Alderman shall be similarly decided to be out of order, such Alderman shall be called upon by the Mayor or Chairman to make such explanation, retraction, or apology as the case may require.

Penalties for persisting in disorderly conduct.

54. Any member of the Council who shall have been called to order, and who, after having been twice directed to withdraw as aforesaid, shall refuse to do so, or who shall persist in any line of conduct or argument, or of observations which shall have been decided as aforesaid to be disorderly, or who shall refuse to make such explanation, retraction, or apology as aforesaid when required to do so, or who shall be guilty of any other act of disorder as defined in section 48 of this Part of these By-laws, and shall refuse to make such explanation, retraction, or apology as a majority of the Aldermen then present shall consider satisfactory, shall be liable on conviction for the first offence to a penalty of not less than ten shillings nor more than five pounds; and on a second conviction for the like offence, he shall be liable to a penalty of not less than one pound nor more than ten pounds; and on the third conviction and for every further conviction for the like offence, he shall be liable to a penalty of not less than two pounds nor more than twenty pounds.

Power of Council as to laying down general rules, &c.

55. Any Alderman who is dissatisfied with the decision of the Mayor or Chairman on any such question of order or of practice may, by motion of notice, respectfully worded, invite the Council to lay down a different rule or principle for the determination of any similar questions of order or practice which may thereafter arise; any rule or principle thus laid down shall be binding upon all parties unless and until it be rescinded, but shall have no retroactive operation: Provided however, that nothing herein contained shall be held to bind any Mayor or Chairman to put any motion to the Council which in his opinion is contrary to law.

Mode of Voting.

How questions are to be put.

56. The Mayor or Chairman shall put to the Council all questions on which it shall be necessary that a vote be taken, and shall declare the sense of such question thereon; and he shall be at liberty to put any such question as often as may be necessary to enable him to form and declare his opinion as to the opinion of the majority.

Divisions—Penalty for refusing to vote.

57. Any Aldermen shall be at liberty to call for a division in such case the question shall be first put in the affirmative and then in the negative; and the Aldermen shall vote by a show of hands, and the names and votes of the Aldermen present when a division is called for shall be recorded, any Alderman who shall be present when a division is called for and shall not vote on such division (not being disabled by law from so voting), shall be liable for every such offence to a penalty of not less than ten shillings nor more than five pounds.

Protests.

Mode of protesting; protest to be recorded, but may under certain circumstances be expunged.

58. Every member of the Council (the Mayor included) may protest against any resolution or vote by the Council; notice in writing of the intention so to protest must however be given at the meeting when such resolution is passed or such vote is arrived at, and the protest itself must be handed or sent to the Council Clerk not later than seven days after such notice; the Council Clerk shall enter every such protest in the minute-book, but if in the opinion of the Council it be inconsistent with the truth or disrespectfully worded it may (by resolution on notice) be ordered to be expunged; in such case the expunction shall be made by drawing a perpendicular line with the pen through the entry of such protest with reference in the margin to the resolution ordering such expunction.

Committees of the Whole Council.

Rules applicable to business in Committee.

59. The following sections of this Part of these By-laws shall, (except as herein excepted) be taken to apply to the conduct of business in Committee of the whole Council, namely, sections 14 (except that it shall not be necessary that any motion or amendment in Committee shall be seconded), 15, 16, 17, 18, 38, 39, 42, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 56, and 57.

Disorderly conduct in Committee.—Refusal to vote.

60. Whenever any member of the Council shall, while the Council is in Committee of the Whole, be considered guilty of an offence against good order within the meaning of section 54 of this Part of these By-laws, it shall be competent to any Alderman to move that the Council resume its sitting and that such matter be reported; and if such motion be carried such matter shall be reported accordingly, and an entry of such report shall be made in the minute-book; and whenever any Alderman shall have refused to vote on any occasion in Committee of the whole Council, as required by section 56 of this Part of these By-laws, the facts shall be reported to the Council, and such report on such facts shall be duly recorded in the minute-book: Provided that in the case of an Alderman failing to vote as aforesaid no special motion that the Council resume its sitting shall be necessary, but it shall be the duty of the Chairman of such Committee of the Whole, in making his report of the proceedings in such Committee, whenever such report may be made, to include in such report a statement of such failure to vote as aforesaid, and of the question as to which such Alderman has so failed to vote.

Decisions in Committee on points of order may be reported.

61. Whenever a decision upon any question of order shall have been given by the Chairman of a Committee of the Whole Council under the provision of section 47 of this Part of these By-laws, any Alderman may move that such decision be embodied in the report to the Council of the proceedings in such Committee, and if such motion be carried such decision shall be so embodied in such report whenever the same shall be made.

How progress may be reported, &c.

62. Any Alderman may at any time during the sitting of a Committee of the whole Council move that the Chairman report progress (or no progress, as the case may be), and that leave be asked to sit again at a later period of the same day, or on any further day, or that no leave be asked to sit again; and if any such motion be carried the Council shall resume its sittings and a report be made accordingly, but no discussion shall be permitted on any such motion, and if the same be negatived the subject then under consideration shall be discussed before another motion shall be receivable.

Report of proceedings in Committee.—Want of quorum in Committee.

63. All reports of proceedings in Committee of the whole Council shall be made to the Council *viva voce* by the Chairman of such Committee, and the report of such proceedings shall be made in every case except when it will be found on counting the number of members during the sitting of any such Council that there is not a quorum present. In the latter case the sitting of the Council shall be resumed without any motion for that purpose, and the proceedings in Committee shall be considered to have lapsed: Provided that in making of any such report as aforesaid it shall not be necessary to report any such proceedings *in extenso*, but only to state the results, general effect, or substance of such proceedings.

How reports are to be dealt with.

64. Any such report of proceedings in Committee of the whole Council shall be recorded in the minute-book, but except as hereinafter mentioned no such report shall be considered as adopted by the Council, nor shall any such application as aforesaid for leave to sit again be considered to have been granted by such Council until a motion shall have been made and passed for such adoption or for the granting of such leave. And every such motion for the adoption of a report or for the granting of such leave as aforesaid, and the order of debate on such motion, shall be subject to all the same rules as other motions in Council and the order of debate on such motions: Provided, however, that where a report shall have been made under section 59 of this Part of these By-laws of disorderly conduct in Committee, under section 57 of this Part of these By-laws, of failure to vote on division, or of any division in Committee upon any question of order, such report shall, so far as it relates to such facts, be regarded and recorded as a statement thereof, and to that extent shall not, unless for the correction of a manifest error, be interfered with upon any pretext whatever.

Calls of the Council.

How calls may be ordered.

65. A call of the Council may be ordered by any resolution of which due notice shall have been given for the consideration of any motion or matter of business before such Council.

Such call compulsory in certain cases.

66. There shall, without any special order to that effect, be a call of the Council for the consideration of every motion which may be made under section 55 of this Part of these By-laws and of every motion for the rescission of any resolution, order, or decision of such Council.

Mode of proceeding.

67. The call shall be made immediately before the motion or business for which such call has been ordered or is required to be made by the last preceding section shall be moved or considered. Such call shall be made as follows:—The Council Clerk shall call the names of all the members in their alphabetical order; each member present shall answer to his name as so called, and if any members are absent a record shall be made of such absence; but if leave of absence to any such member shall have been previously granted, or if such an excuse in writing shall have been forwarded to the Mayor or Council Clerk as a majority of the Council then present shall consider satisfactory, such absent member shall stand excused, and a record of such excuse shall be made and of the reasons for the same.

Penalty for absence without legal excuse.

Further call when question adjourned.

68. Any member of the Council who, having had notice of such call of the Council, shall not answer to his name as aforesaid, or who, being absent, shall not be legally excused as aforesaid, or who, if absent and not so excused, shall fail to show that, by reason of extreme illness or any other sufficient reason, he has been unable to send an excuse in writing as aforesaid, or who, having answered to his name as aforesaid, shall not be present when a vote is taken on the motion or business as to which such call has been made as aforesaid, shall for every such offence be liable to a penalty of not less than five shillings nor more than one pound: Provided that if the consideration of every such motion or matter of business be adjourned to a future day, there shall be a further call on the resumption of such consideration, and the provisions herein as to penalties for absence shall have reference to such further call; and if there shall be more than one adjournment, this proviso shall be taken to extend to the resumption of the consideration of such motion or matter of business after every such adjournment.

Standing and Special Committees.

Standing Committees

69. There shall be three Standing Committees, namely, a By-law Committee, a Committee for Works, and a Finance Committee; these committees shall be re-appointed every year at the first meeting of the Council which shall be holden after the election of Mayor.

70. Each Standing Committee shall consist of three members.

Mode of re-appointing Standing Committees.

71. The re-appointment of the three Standing Committees may, on resolution of the Council, be made by ballot; in such case a list or lists of the members shall be handed to each then present, who shall mark against the name of each such member the title of the committee to which in his opinion such member ought to belong; and the Mayor or Chairman shall thereupon examine such lists so marked, and shall declare the result; and if there shall be an equal number of votes for the appointment of any two or more members to any one of such committees such Mayor or Chairman shall decide which of such members shall be appointed.

By-law Committee.

72. The By-law Committee shall prepare for the consideration of the Council drafts of all such by-laws as may be required for the good government of the Borough; they shall also watch over the administration of the By-laws and of any statute of which the operation has been or may be extended to the Borough; and shall take such steps as may be necessary for the prevention or punishment of offences against such by-laws or statutes, and for the preservation of public health, order, and decency.

Committee of Works.

73. The Committee of Works shall have the general directions of all works ordered or sanctioned by the Council, and the general inspection of all streets, roads, ways, bridges, public reserves, and other public places under the control and management of the Council; they shall also inquire and report from time to time as to such improvements and repairs as they may think necessary, or as they may be directed by resolution of the Council to inquire and report upon.

Finance Committee.

74. The Finance Committee shall examine and check all accounts, and shall watch generally over the collection and expenditure of municipal revenues; they shall inquire and report from time to time as to all matters which they may consider to affect, or to be likely to affect, the finances of the Borough, and as to such matters or subjects of the like nature as they may be directed by resolution of the Council to inquire and report upon.

Special Committees.

75. Special Committees may consist of any number of members, and may be appointed for the performance of any duties which may be lawfully entrusted to a committee, and for which, in the opinion of the Council, a Special Committee ought to be appointed; and no Standing Committee shall interfere with the performance of any duty which may for the time being have been entrusted to any such Special Committee. The appointment of every such Special Committee shall be made by resolution after due notice, and it shall be incumbent on the mover of such resolution to embody therein a statement of the duties proposed to be entrusted to such Special Committee. The mover of any such resolution may name therein such members as in his opinion ought to constitute such committee, or he may propose that such committee consist of a certain number of members to be appointed by ballot; and in the latter case, or if an amendment to the effect that such Special Committee be appointed by ballot be carried, each member then present shall receive a list of all the members of the Council, from which list he shall strike out all names but those of the persons of whom in his opinion such Special Committee ought to be composed; and the Mayor or Chairman shall examine such list and shall declare the result; and in the event of its becoming necessary, through an equality of votes, to decide as to which of two or more aldermen shall serve on such committee such Mayor or Chairman shall so decide.

Chairman of Committees.

76. Every Committee of which the Mayor shall not be a member shall elect a permanent Chairman of such committee within seven days after their appointment.

Term of service in Committee.

77. Appointments to the By-law Committee, the Committee of Works, and the Finance Committee shall be for the whole municipal year; the Chairman of these three Committees, as appointed to or removed from the Chairmanship of the same, shall be thereby and without any further order regarded as having been appointed to or removed from the Committee for

General Purposes. The appointment of every Special Committee shall be considered to endure until the duties for which such Committee has been appointed shall have been fully performed; provided however that nothing herein contained shall be held to affect in any way the right of such Committee to remove any Chairman of such Committee, or to appoint another such Chairman in his stead, or to militate against the general provisions as to Committees in sections 109 and 110 of the Municipalities Act of 1867, and that so much of this By-law as relates to the appointment, powers, and duties of Committees shall be read and interpreted in connection with such last-mentioned general provisions.

Committee meeting—how called.

78. The Council Clerk shall call a meeting of any Committee when requested to do so by the Chairman or any two members of such Committee.

Records of transactions in Committee.

79. The Chairman of each Standing Committee shall make or cause to be made in a book to be kept by him for that purpose memoranda of all the transactions of such Committee, which book he shall, on ceasing to be such Chairman, hand over to his successor.

Expenditure.

Except in urgent matters, cost of all work to be estimated before undertaken.

80. With the exception of urgent matters, hereinafter specially provided for, no work affecting the funds of the Borough shall be undertaken until the probable expense thereof shall have first been ascertained by the Council.

Urgent matters and necessary current expenses: Expenses authorized to be reported; Outlay to be in accordance with orders of the Council.

81. For urgent matters and for necessary current expenses during the intervals which may elapse between the meetings of the Council outlays to the following extent may be incurred:—

(1.) By order of the Committee for Works, or of the Mayor and one member of such Committee, for repairs or emergent works, to the extent of £5.

(2.) By order of the Mayor and any two aldermen, or without the Mayor, of any four aldermen, for any urgent purpose, to the extent of £5.

(3.) By order of the Mayor for necessary current expenses, to the extent of £2.

Provided that in every case a detailed report in writing of every such outlay shall be laid before the Council at its next meeting, such report to be signed by the Chairman of the Committee of Works or the Mayor, or the Mayor and aldermen, or the aldermen without the Mayor, as the case may be, by whom such outlay shall have been authorized; also that such outlay shall only be permissible in reference to matters coming strictly within the jurisdiction or functions of the Council; and that no outlay involving a disobedience or evasion of any order or resolution of such Council shall on any pretence be thus authorized.

All claims to be examined and reported upon by the Finance Committee.

82. All accounts and demands of money against or from the Council shall be examined and reported on by the Finance Committee before any order shall be made for payment of such accounts or demands.

Certificate required with each claim—Salaries and wages to be payable on Mayor's order—Certificates to be attached to reports.

83. No payment shall be ordered unless there shall be a certificate or memorandum from the Committee, from the Mayor, or from the officer of the Council to whom the direction or guardianship of such expenditure properly belongs, showing that the demand is a legitimate one, and has been duly authorized or inquired into; it shall be the imperative duty of the Finance Committee to see that this requirement is fulfilled, or to report specially as to the reason of its non-fulfilment, before recommending payment; provided also that in cases of special expenditure under section 80 of this Part of these By-laws the report directed by that section to be laid before the Council shall, if the outlay shall have been lawfully incurred, be deemed a sufficient certificate; and provided further that in regard to salaries and wages of labour for officers, servants, and labourers employed at fixed rates of payment, by order of the Council, the certificate of the Mayor of the amounts due to any such officer, servant, or labourer, and the order of such Mayor for the payment of such amount, will be a sufficient authorization for such payment; and such certificates, memoranda, and authorizations shall be attached respectively to the reports from the Finance Committee on the payments or outlays to which such certificates, memoranda, or authorizations have reference.

Common Seal and Records of Council.

Common seal and press, how secured; care of same.

84. The common seal and the press to which the same is attached shall be secured by a cover or box, which, except when such seal and press are in use, shall be kept locked. There shall be duplicate keys to the lock of this cover or box, of which keys one shall be kept by the Mayor and the other by the Council Clerk.

How and when common seal to be used.

85. The common seal shall not be attached to any document without an express order from the Council; in every case when such common seal has been ordered to be attached to any document such document shall also be signed by the Mayor, or, in case of the absence or illness of such Mayor, by two aldermen, and countersigned by the Council Clerk.

How books of accounts are to be kept and inspected.

86. The Treasurer shall keep such books of account and such records, statements, and memoranda of receipts and expenditure in such manner and form as the Council may from time to time direct; it shall be the duty of the Finance Committee to inspect all such books of account, records, statements, and memoranda from time to time, to ascertain that the same are properly kept, and to report at once to the Council any act of neglect or appearance of inefficiency which they may have discovered in the keeping of the same; also to report to the Council from time to time any changes which such Committee may think advisable in the mode of keeping the accounts.

Records of the Council defined—Provisions for proper keeping of same.

87. The minute-book, letter-book, and all rate and assessment books, books of accounts, records, statements, and memoranda of receipt and expenditure, electoral rolls and other records relating to elections, business papers, reports from Committees, minutes from the Mayor, petitions, letters on municipal business addressed to the Council or to the Mayor, or to any officer or servant of the Council, orders, reports, returns, and memoranda relating to municipal business, drawings, maps, plans, contracts, specifications, agreements, and all other books and papers connected with the business of the Council shall be deemed records of the Council; all such records other than the minute-book and other books, and other than electoral rolls and other records relating to elections, shall be numbered and filed in due order, and shall be duly registered by the Council Clerk in a book to be kept by him for that purpose. Upon the face of every document thus registered to which there is any reference in the minute-book there shall be a note of the page wherein it is so referred to; and when any order has been made by the Council, or a report has been brought up by any Committee thereof in reference to any document so registered as aforesaid, a note of such order or report shall be made upon the document. It shall be the duty of the By-law Committee to inspect the records from time to time to ascertain that the same are properly kept as aforesaid, and to report at once to the Council any act of neglect or appearance of inefficiency which they may discover in the keeping of such records.

Impression of seal not to be taken, &c., without leave of the Council—penalties.

88. No member or officer of the Council shall be at liberty to take an impression of the corporate seal, or to show, lay open, or expose any of the books or records of the Council to any person other than a member of the same, without leave from such Council, except as otherwise provided by law. Any member or officer of the Council who shall be guilty of a breach of this section shall be liable, on conviction, for the first offence to a penalty of not less than 5s. nor more than £2; for the second offence to a penalty of not less than £1 nor more than £10; and for a third and every subsequent offence to a penalty of not less than £5 more than £25.

Records not to be moved, &c.; penalties, exceptional circumstances—Receipt to be given in every case before document received—Proviso as to use of records as matters of evidence.

89. Any person removing any such book or other record of the Council as aforesaid from the Council Chamber or the place where by direction of the Council such book or other records is usually kept, without leave for such removal having been first obtained by such Council, or without other lawful cause for such removal as hereinafter provided, shall for every such offence be liable to a penalty of not less than 10s. nor more than £10. And nothing herein contained shall be held to affect the further liability of any person who shall have removed such book or other record as aforesaid, and shall not have returned same, to prosecution for stealing such book or record, or to an action at law for detention of same, as the circumstances of the case may warrant: Provided that leave for temporary removal of a book or other record may be granted to the Town Clerk or the Treasurer by the Mayor, in order that such Clerk or Treasurer may post up entries, prepare returns, or perform any other duty which it may be necessary that he or they should perform; also, that the Mayor or Chairman of any committee, or any alderman acting for such Chairman, may temporarily remove any record necessary for the preparation of a minute or a report, or for the purpose of any prosecution or suit at law, by, against, or at the instance of the Council; but in all cases such Clerk, Treasurer, Mayor, Chairman, or Alderman, as the case may be, shall give a receipt under his hand for every document so removed, and every such receipt shall be carefully preserved among the records until the book or other record to which it refers shall have been returned, when such receipt shall be destroyed; and provided also that the Mayor, Town Clerk, or other officer of the Council who may be subpœnaed to produce any book or other record of

the Council in a court of law shall have the right to remove such book or other record for the purpose of obeying such summons, but shall return such book or record as speedily as may be, and shall before removing the same leave at the Council Chamber a receipt for such book or other record of the Council as aforesaid, shall be legally responsible for the safe keeping and return of the same.

Penalty for defacing or destroying record.

90. Any person destroying, defacing, or altering any record of the Council shall for every such offence be liable to a penalty of not less than £5 nor more than £50.

Officers and Servants—notice to Candidates.

91. No appointment to any permanent office at the disposal of the Council shall take place until notice shall have been given as hereinafter provided, inviting applications from qualified candidates for the same. The salary or allowance attached to the office shall in every case be fixed before such advertisement is published, and shall be stated in such advertisement.

Mode of appointment.

92. Every such appointment shall be made by ballot, in such mode as may at the time be determined upon, whenever there is more than one candidate for such permanent office.

Exceptional cases.

93. Nothing herein contained shall be held to prevent the employment, as may from time to time be found necessary and as may be ordered by the Council, of any workmen or labourers on the public works of the Borough.

Bonds of good conduct.

94. All bonds given by officers or servants of the Council for the faithful performance of their duties shall be deposited with the Attorney or the Bankers of the Corporation, as the Council may order; and no officer or servant of the Council or any member of the Council shall be received as surety for any other such officer or servant.

Duties of Town Clerk.

95. The Town Clerk, in addition to the duties which by the Municipalities Act of 1867, or by the present or any other by-law thereunder, he may be required to perform, shall be the Clerk of all Revision Courts held in the Borough under the provisions of the said Municipalities Act; he shall also, under the direction of the Mayor, conduct all correspondence which may be necessary on the part of the Council; he shall likewise have charge of all the records of such Council, except such books or documents as may as hereinafter provided be entrusted to any other office, and shall be responsible for the safe keeping of such records; he shall generally assist the Mayor in carrying out the orders of the Council and the duties of such Mayor; he shall be required to give security in the sum of £400.

Duties of Treasurer,

96. The Treasurer shall have charge of such books of account and other records of the Council as are mentioned in section 86 of these By-laws, and shall be responsible for the safe keeping of such records.

Duties of other officers and servants.

97. The duties of all officers and servants of the Corporation shall be defined by such regulations as may from time to time and in accordance with law be made, as follows, viz.: As to the duties of the Town Clerk and his assistants, by the Mayor; as to the Treasurer and all collectors of rates, bailiffs, bailiff's assistants, and other officers and servants employed in and about the collection of revenue, whose superintendence is not herein specially entrusted to any other committee, by the Finance Committee; as to all surveyors, architects, clerks of works, overseers, inspectors of water supply, sewerage or drainage thereof, whose superintendence herein is not specially entrusted to any other committee, by the Committee of Works; as to the attorney for the corporation, inspector of nuisances, and other officers and servants employed in and about the carrying out and employment of the general provisions of the Municipalities Act of 1867, and of any other statute of which the operation has been extended to the Borough, and of the by-laws for the general good government of such Borough whose superintendence is not herein specially entrusted to any other committee, by the By-law Committee; and as to librarians, managers of public institutions or reserves under the charge of the Council, and all other officers and servants employed in and about any matter over which the Council has control, and whose superintendence is not herein specially entrusted to any other committee by the Mayor, by the Works Committee: Provided that all such regulations shall be in writing, and shall be in all cases laid before the Council at the first meeting thereof which shall be holden after the making of any such regulations, and shall be in strict accordance with any such orders or directions as may have been at any time given by such Council touching the matters to which any such regulation may have reference.

pecial power of Mayor.

98. The Mayor shall exercise a general supervision over all officers and servants of the Council, and may order the preparation of any such return or statement or the giving of any such explanation or information by any such officer or servant as he may think necessary, unless such return or statement shall have been already prepared, or such explanation or information already given, and such return, statement, explanation, or information is on record as hereinbefore provided; or unless the Council shall have expressly forbidden or dispensed with the preparation of such return or statement, or the giving of such explanation or information. All such returns or statements as aforesaid shall be in writing, and shall be recorded; all such explanation or information may, except as hereinafter provided, be either rendered *viva voce*, or put into writing, as the Mayor may direct.

How complaints against officers, &c., are to be dealt with.

99. All complaints against officers or servants of the Corporation must be in writing, and must in every case be signed by the person or persons complaining, and no notice whatever will be taken of any complaint which is not in writing or is anonymous; all such complaints may be addressed to the Mayor, who immediately upon the receipt of any such complaint, and without laying the same before the Council, shall have power to investigate the same; and if any such complaint be made to the Council or to any member or officer thereof, it shall be referred to and investigated by the Mayor before it shall be in any way (other than by such reference) ordered upon or dealt with by such Council: Provided that every report, explanation, and information which may be made or rendered in reference to every such complaint shall be in writing, and such Mayor shall state in writing the result of every such investigation, and his opinion as to what order (if any) ought to be made in connection therewith: and the Mayor's statement as aforesaid thereon shall be laid before the Council at the next meeting thereof which shall be holden after the Mayor shall have made such statement, and shall be duly recorded: Provided further that nothing herein contained shall be held to affect in any way the special power conferred on the Mayor by section 152 of the Municipalities Act of 1867, or any other special power which now is or hereafter may be conferred by statute upon such Mayor.

MISCELLANEOUS.

Leave of absence.

100. No leave of absence shall be granted to the Mayor or to any Alderman otherwise than by a resolution of the Council adopted after due notice.

By-laws, draft of, to lie in office seven days, &c.

101. A draft of every intended by-law shall lie in the office of the Council for at least seven days before such draft is taken into consideration by the Council, and shall be open to the inspection of every ratepayer who may desire to inspect the same; and public notice shall be given as hereinafter provided that such draft is so lying for inspection.

Motions for recission of previous orders.

102. Whenever a motion for the rescission of any order, resolution, or vote of the Council shall have been negatived, no other motion to the same effect shall be permissible until a period of three months shall have elapsed from the time of negativing such first-mentioned motion: Provided that nothing herein contained shall be held to prohibit the reconsideration and amendment of any proposed by-law which may have been submitted to the Governor for confirmation, and may have been remitted to the Council, with suggested amendments of the same, or the passage after due notice as hereinbefore provided, and in due course of law of any by-law for the repeal or amendment of any other by-law.

Lapsed Business.

103. Whenever the consideration of any motion or matter of business shall have been interrupted by reason of a quorum not having been present the resumption of such consideration may be ordered by resolution of the Council after due notice, and such consideration shall in such case be resumed at the point where it was so interrupted as aforesaid.

Suits and prosecutions for penalties.

104. Such suits or information for the enforcement of penalties for or in respect of breach of the Municipalities Act of 1867, or of any by-law made thereunder, or of any statute the operation of which may have been extended to the Borough as may have been directed by the Council, or by the By-law Committee, or by the Mayor, to be commenced or laid, shall be so commenced or laid as follows, namely:—When against a member of the Council, or an Auditor, or any officer of the Council, by the Town Clerk, unless he shall be the officer to be proceeded against, and in such case by any other officer named by the Council for that purpose; when against any other person, by the officer to whom the carrying out of the statutory provision or by-law imposing the penalty sought

to be enforced has been entrusted; and if there shall be no such officer, then by any such officer or person as shall be appointed for that purpose by the Council, or by the By-law Committee, or by the Mayor, as the case may be, on directing such suit or information as aforesaid; and no such suit shall be brought or information laid as aforesaid against any member of the Council or Auditor except by order of such Council, nor shall any similar proceeding be taken against any officer of the Council except by order of such Council or of the Mayor, nor against any other person except upon the order of the Council, or of the Mayor, or of the By-law Committee; and no such suit shall be directed to be brought, nor shall any such information be directed to be laid as aforesaid, except on express resolution of the Council, in any case where the bringing of such suit or the laying of such information will be adverse to any previous direction by such Council, or where on the trial or hearing of any such suit or information may on the order of the Council be entrusted to an attorney.

Mode of proceeding in cases not provided for.

105. In all cases not herein provided for resort shall be had to the rules, forms, and usages of the Legislative Assembly of New South Wales, so far as the same are applicable to the proceedings of the Council.

Power to suspend temporarily any portion of these By-laws.

106. Any of the foregoing By-laws which relate to or affect the proceedings at meetings of the Council may be suspended *pro tempore* without notice in cases of emergency, if all the members of the Council then present shall deem such suspension necessary.

Part II.

Collection and Enforcement of Rates.

Rates when due and payable.

1. All rates levied and imposed by the Council shall be held to be due and payable on and after such day or days as the Council shall by resolution from time to time appoint.

Time and place of payment.

2. All such rates shall be paid at the Council Chambers during the hours appointed by the Council for that purpose.

Special rates.

3. All rates levied or imposed by the Council under sections 165, 166, and 167 of the Municipalties Act of 1867, and for the purposes mentioned in the said sections, or under the provisions of any of the said sections, or for any of the purposes mentioned in the said sections, shall be collected in such manner and shall be held to be due and payable on and after such day or days as the Council may by resolution at the time of making or imposing such rates, or any of them, have appointed.

Mayor to enforce payment.

4. It shall be the duty of the Mayor to take proceedings to enforce the payment of all rates in default, either by action at law or by issuing warrants of distress upon the goods and chattels of the defaulter.

Bailiff—how appointed.

5. The bailiff of the Municipality shall be appointed by the Council, and may from time to time be removed by the said Council.

Enforcement by distress bailiff.

6. A bailiff shall, when found necessary, be appointed by the Mayor.

Bailiff's sureties.

7. The bailiff shall find two sureties to the satisfaction of the Mayor, to the extent of £25 each, for the faithful performance of his duties.

Duty of bailiff.

8. It shall be the duty of the bailiff to make all levies by distress for the recovery of rates in the manner hereinafter provided.

Warrant of distress.

9. All levies and distresses shall be made under warrant in the form of Schedule A hereto, under the hand of the Mayor or any Alderman who for the time being may be duly authorized to perform the duties of that office.

Distress and sale, &c.

10. It shall be lawful for the bailiff or his deputy, and such assistants as he or they may take with them, to enter into any part of the land, building, tenement, or other property in respect of which such rate or rates shall have been made as aforesaid, and to distrain therein or thereon, and to remain in such building or other property in charge thereof. And if the sum for which any distress shall have been made or taken, together with the costs of such restraint, shall not have been paid on or before the expiration of three clear days, the bailiff or his deputy may, between the hours of 11 in the morning and 2 in the afternoon on the next day thereafter cause the goods so distrained or a sufficient portion thereof to be sold by public auction, either on the premises or at such other place within the Municipality as the bailiff may think proper to remove them for such purpose, and shall pay over the surplus (if any) that may remain, after deducting the amount of the sum distrained for and the cost of such distraint, to the owner of such goods so sold, on demand by such owner.

Inventory of goods seized to be delivered to ratepayer.

11. At the time of making a distress the bailiff shall make out a written inventory in the form of Schedule B hereto, which inventory shall be delivered to the occupant of the land or premises, or the owners of the goods so distrained, or to some person on his or her behalf resident at the place where the distress shall be made; and in case there shall be no person at such place with whom such inventory can be left as aforesaid, then such inventory shall be posted on some conspicuous part of the land or premises on which the distress is made, and the bailiff shall give a copy of the inventory to the ratepayer on demand at any time within one month after making such distress.

Goods may be impounded.

12. The bailiff on making a distress as aforesaid may impound or otherwise secure the goods or chattels so distrained, of what nature or kind whatever, in such place or places or in such part of the land or premises chargeable with rates as shall be most fit and convenient for this purpose; and it shall be lawful for any person whomsoever, after the expiration of three days, to come and go to and from such place or part of the said land or premises where such goods or chattels shall be impounded and secured as aforesaid, in order to view and buy, and in order to carry off and remove the same on account of the purchaser thereof.

Owner to direct order of sale.

13. The owner of any goods or chattels so distrained upon may, at his or her option, direct and specify the order in which they shall be successively sold, and the said goods or chattels shall in such case be put up for sale according to such direction.

Proceeds of Distress.

14. The bailiff shall hand over to the Town Clerk all proceeds of every such distress within twenty-four hours after having received the same.

Bailiff's Fees.

15. There shall be payable to the bailiff for the use of the Council for every levy and distress made under this By-law the costs and charges in the Schedule hereunto annexed, marked C.

Schedule A.

Warrant of Distress.

I, Mayor of the Municipal Borough of Narrandera, do hereby authorize you, , the Bailiff of said Municipality, to distrain the goods and chattels in the dwelling-house (or in and upon the land and premises) of situate at for being the amount of rates due to the said Municipality to the day of for the said dwelling-house, or land or premises, as the case may be, and to proceed for the recovery of the said rates according to law.

Dated this day of , 188 .

Mayor

Schedule B.

I have this day, in virtue of the warrant under the hand of the Mayor of the Municipal Borough of Narrandera, dated distrained the following goods and chattels in the dwelling-house (or in and upon the land and premises) of situate at within the said Municipality, for , being the amount of rates due to the said Municipality to the day of 188 .

Dated this day of , 188 .

Bailiff.

Schedule C.

Costs.

	s.	d.
For every warrant of distress	2	0
For every warrant and making levy where the sum is not more than £20	2	0
Above that sum in addition to every £1	0	1
For making and furnishing copy of inventory	2	0
For man in possession each day or part of day	5	0
For sale, delivery, and commission of goods per £ on proceeds of sale	1	0

Part III.

Preventing and Extinguishing Fires.

Fire or combustible materials, &c.

1. Every person who shall place or knowingly permit to be placed in any house, yard, workshop, out-offices, or other premises, fire, gunpowder, or other combustible or inflammable materials of any kind, in such a manner as to endanger any buildings, shall on conviction for every such offence forfeit and pay a penalty of not more than £10, and shall forthwith remove such fire, gunpowder, or combustible or inflammable materials; and every such person who shall suffer any such fire, gunpowder, or inflammable materials to remain as aforesaid for a period of twelve hours after any such conviction shall be deemed guilty of a further offence against this By-law.

Inflammable fences, &c.

2. Every person who shall erect any fence of brushwood, bushes, or other inflammable material, or shall make or place any stack of hay, corn, straw, or other produce, or place as for the covering of any such stack any inflammable material, so as to endanger any buildings or properties, or any trees, shrubs, or other produce of such properties, or any chattels in or upon such buildings or properties, shall forfeit on conviction for every such offence a penalty of not more than £5, and shall also remove such fence, stack, or covering within a reasonable time after any such conviction as aforesaid; and any person failing to remove such fence, stack, or covering within a reasonable time after any such conviction as aforesaid shall be deemed guilty of a further offence against this By-law.

Setting on fire wilfully any inflammable matter.

3. Every person who shall wilfully set fire to any inflammable matter whatsoever in the open air, without having given notice in writing to the occupiers of the land adjoining to the land upon which such matter shall be located, and also inform the Town Clerk of his or her intention so to do, and receive written permission from him so to do, and the occupant of the said adjoining land, shall forfeit a sum not exceeding £5.

Lighting bonfires.

4. Any person who shall light any bonfire, tar-barrel, or firework upon or within sixty yards, or shall discharge any firearms within one hundred yards, of any public or private street or any public place, or shall sell gunpowder, squibs, rockets, or other combustible matter by gas, candle, or artificial light, shall forfeit a sum of not exceeding £5.

Setting on fire chimney flues.

5. Every person who wilfully sets or causes to be set on fire any chimney flue, smoke vent, or stove pipe, shall forfeit a sum not exceeding £5.

Chimneys catching fire by neglect.

6. If any chimney catch fire through the neglect of any person occupying or using any premises in which such chimney is situated shall forfeit a sum not exceeding £2: Provided always that such forfeiture shall not be enforced if such person prove to the satisfaction of the Justices before whom the case is heard that such fire was in no way owing to the neglect or carelessness, whether with respect to cleansing such chimney or otherwise, of himself or his servant.

Extinguishing fires.

7. For the extinguishing fires, the occupier of every dwelling house, warehouse, or shop, or other building, shall at all times keep therein or upon the land appertaining thereto, in some fit reservoir, butt, or tank, clean water in quantity not less than fifty gallons, or possess a well with good supply of clean water within one chain from said premises, or being within the same distance from any creek or river shall have access to a similar supply of good water for the purposes aforesaid; and every such occupier who shall make default contrary to this section shall forfeit a sum not exceeding £1; and every such occupier shall for every day of such default be deemed guilty of an offence against this By-law.

Water-carts.

Licensing of.

8. The Council shall from time to time license to ply within the Municipality such carts for the carrying of and sale of water and extinguishing fires as shall on inspection be found fit for that purpose; every such cart or vessel for the holding of water for the purposes aforesaid shall be capable of containing not less than fifty gallons, and shall have the name of the owner and the words "Licensed water-cart" painted on such cart in legible letters.

How water-cart licenses are to be obtained.

9. Every such license shall be issued on the written application of the owner thereof, in which application shall set forth the name and surname and place of abode of the applicant, and for every such license there shall be paid to the Council the sum of 2s. 6d; and every such license shall be in force until the 31st day of December in each and every year after the granting of said license.

Penalty for hawking or carrying water for sale without license.

10. Any person hawking or carrying water for sale or hire within the Municipality otherwise than in a licensed water-cart as aforesaid shall upon conviction be liable to a penalty not exceeding £1.

Licensed water-carriers to carry vessels loaded with water.

11. Every driver and owner of a licensed water-cart shall keep such cart loaded with water during all times after sunset and before sunrise, and shall if any premises or property shall be on fire within the Borough attend at the place of such fire with such cart so loaded as aforesaid with water, and shall continue to cart water by full loads to such place, and shall deliver such water in such manner as may be required by the Mayor or by any Alderman or officer, or person duly authorized by the Council in that behalf, and then present for the purpose of extinguishing such fire; and every such owner or driver who shall without reasonable excuse fail to comply with the provisions of this section shall forfeit a sum not exceeding £10.

Fees to be paid to the owners of licensed water-carts.

12. There shall be paid out of the funds of the Borough to the owner of every licensed water-cart who shall have attended with as sufficient water within his power or capability at the place of any fire as herein provided, and delivered the same as required for the purpose of extinguishing such fire, such reasonable compensation as the Council shall by resolution have appointed in that behalf; and also, to such owners of such carts as shall have first and second in order attended with loads of water such further sums of money by way of reward as the Council, by similar resolution, shall have fixed upon.

Part IV.

Streets and Public Places—Public Health and Decency, &c.

New roads to be reported on.

1. No new public road, street, way, reserve, or other place proposed to be dedicated to the public shall be taken under the care and management of the Council until after such road, street, way, or reserve shall have been examined by the Committee for Works, and reported upon to the Council by such Committee.

Plans of proposed new roads to be delivered to the Council.

2. When any proprietor or proprietors of land within the Borough shall open any road, street, or way, or lay out any park or other place for public use or recreation, through or upon such land, and shall be desirous that the Council shall undertake the care and management of such road, street, way, reserve, or other place, he or they shall furnish the Council with a plan or plans, signed by himself or themselves, showing clearly the position and extent of such road, street, way, reserve, or other place as aforesaid.

Dedication of new roads.

3. If the Council determine to take charge of any such road, way, or other place as aforesaid, the plan or plans so signed as aforesaid shall be preserved as a record or records of the Council; and the proprietors or proprietor aforesaid shall execute such further instrument dedicating such road, way, reserve, or other place to public use or recreation as aforesaid, as may be considered necessary by the Committee for Works, and such instrument of dedication shall also be preserved as a record of the Council.

Committee for Works to fix street levels.

4. The Committee for Works, or any officer or person acting under the supervision of such Committee, shall, subject to such orders as shall from time to time be made by the Council in that behalf, fix and lay out the levels of all public roads, streets, and ways within the Borough, and the carriage and foot ways thereof; and it shall be the duty of such committee, officer, or person to place posts at the corners of intersections of any such public roads and streets whenever the same may be considered necessary or desirable by the Council. Provided that there shall be no change of level in any public road, street, or way until the same shall have been submitted to and adopted by the Council as hereinafter directed.

Change of street levels.

5. Whenever it may be deemed necessary to alter the level of any public road, street, or way as aforesaid, the Committee for Works shall cause a plan and section showing the proposed cutting to be exhibited at the Council Chamber for seven days, for the information and inspection of ratepayers, and shall notify by advertisement in some newspaper circulating in the Borough that such plan is so open for inspection: and no objection thereto shall be entertained by the Council unless made within twenty-one days after such notice shall have been given; at a subsequent meeting of the Council the said plan and section, if adopted, shall be signed by the Mayor or Chairman and the proposer and seconder of the motion for such adoption, and countersigned by the Town Clerk, and such plan and section so signed and countersigned shall be a record of the Council.

Noxious weeds.

6. Any person appointed by the Council may enter upon any land within the said Borough, and for that purpose may break open gates, or take down or remove fences, to extirpate the weed known as the Bathurst burr, or Scotch thistle, or other noxious weeds: Provided always that if any gate be broken or fences removed the same shall, immediately after the work then required to be done, be restored to their former condition as nearly as may be, and the expense of extirpating such weeds and restoring such fences may be recovered as an ordinary debt from the owner or occupier of such lands; any person hindering or obstructing any person so appointed as aforesaid shall for every such offence be liable to a penalty of £2; all owners or occupiers of property within this Borough shall remove and burn all kinds of thistles, Bathurst burr, or other noxious weeds upon lands owned, rented, or occupied by them; and any owner, tenant, or occupier neglecting to comply with this By-law after fourteen days' notice from any officer of the said Borough requiring him to remove and burn such weeds as aforesaid shall be liable to a penalty of not less than £1 and not exceeding £5.

No turf, gravel, &c., to be removed from streets without permission.

7. Any person who shall form, dig, or open any drain or sewer, or remove, or cause to be removed, any turf, clay, sand, soil, gravel, stone, or other material, or any road scrapings or sweepings, in or from any part of the carriage or foot ways of any street or any other public place within the Borough, without leave first had and obtained for that purpose from the Borough, or who shall wantonly break up or otherwise damage any such carriage or foot way, shall, on conviction, pay and forfeit for every such such offence any sum not exceeding £5, nor less than £1; and every person who shall have or make any cellar or any opening, door, or window, in or beneath the surface of the footway, or any street, or public place within the said Borough, without the consent of the Council, shall, on conviction, forfeit and pay the sum of £5, over and above the expenses of filling up, remedying, or removing such cellar, opening, door, or window.

Holes to be enclosed.

8. Any person or persons who shall dig or make or cause to be made or dug any hole, or leave or cause to be left any hole adjoining or near to any street or public place within the said Borough for the purpose of making any vault or vaults, or the foundation or foundations to any house or buildings, or for any other purpose whatever, or shall erect or pull down any building, and shall not forthwith enclose the same, and keep the same enclosed in a good and sufficient manner to the satisfaction of the Committee for Works of the said Borough, or shall keep up or cause to be kept up and continued any such enclosure for any time which shall be longer than shall be absolutely necessary, in the opinion of such committee, and shall not place lights upon each side of the said enclosure, and keep the same continually burning, from sunset to sunrise during the continued existence of such enclosure, shall forfeit and pay for every such refusal or neglect any sum not being less than £2 nor exceeding £5.

Open spaces and steps adjoining footways to be enclosed under a penalty.

9. Every owner or occupier of any house, building, or premises or land within the said Municipality having any entrance, area, garden, or other open space, or any vacant building-lot, water-hole, or excavated space adjoining the footway of any street or public place in such Borough, shall protect and guard the same by good and sufficient rails, fences, or other enclosures, to be previously approved of by the Works Committee or any officer whose special duty it shall be to attend to such work, so as to prevent danger to persons passing and repassing; and every such owner or occupier of any such house, building, or premises or land having any steps adjoining the footway or any such street or public place shall in like manner protect and guard the same by fences, rails, or other enclosure, so as to prevent the like danger to persons passing and repassing; and on failure thereof every such owner or occupier shall, as often as he or she shall be convicted of such offence, forfeit and pay a sum not less than £2 nor more than £5; and every such owner or occupier as aforesaid who shall fail to erect such fences or other enclosures as aforesaid, after fourteen days' notice from the Council or any duly qualified officer, shall be deemed guilty of a further offence against this By-law.

Penalty for not covering over wells.

10. Every person who shall have a well situated between his or her dwelling house or the appurtenances thereof and any road, street, or footway within the limits of the said Borough, shall cause such well to be securely and permanently covered over; and if any person having such well as aforesaid shall fail to cover over and secure the same within twenty-four hours after notice shall have been given in writing to him or her by any officer of the said Council, or shall have been left for any such person at his or her usual or last known place of abode, or on the said premises, shall, on conviction, forfeit and pay a sum of 10s. and for every day after such notice that such well shall remain so uncovered, contrary to the provisions hereinbefore made and provided, such person shall be deemed guilty of a separate offence against this By-law.

Temporary stoppage of traffic for repairs.

11. The Committee for Works, or any officer or person acting under the authority of such Committee or of the Council, may at any time cause the traffic of any street, lane, or thoroughfare, or any portion thereof, to be stopped for the purpose of repairing the same or for any necessary purpose; and any person or persons offending against this By-law, either by travelling on street, lane, or thoroughfare, or by removing or destroying any obstruction that may be placed thereon for the purpose of suspending the traffic, shall forfeit and pay a penalty of any sum not exceeding £5 for every such offence.

Drawing or trailing timber, &c., &c.

12. Any person who shall haul or draw timber, or cause to be hauled or drawn upon any part of any street or public place within the said Borough, any timber, stone, or other thing otherwise than upon wheeled vehicles or barrows, or shall suffer any timber, stone, or other thing which shall be carried principally or in part upon any wheeled vehicle or barrow to drag or trail upon any part of such street or public place to the injury thereof, or to hang over any part of any such vehicle or barrow so as to obstruct or occupy the street beyond the breadth of the said vehicle or barrow, shall, upon conviction, forfeit and pay for every such offence a sum not more than £2 nor less than 5s. over and above the damage occasioned thereby.

Driving on footpaths and throwing filth thereon.

13. Any person who shall cast, throw, or lay, or shall cause, permit, or suffer to be thrown, cast, or laid or to remain, any ashes, rubbish, offal, dung, soil, dead animals, blood, or other filth and annoyance, or any matter or thing in or upon the carriage-way or footway of any street or public place in the said Borough, or shall kill, slaughter, dress, scald, or cut up any beast, swine, calf, sheep, or other animal, in or so near to any street or public place as that any blood or filth shall run or flow upon or cover or be on any or either of any such carriage or foot ways, or shall run, roll, drive, draw, place, or cause, permit, or suffer to be run, rolled, driven, drawn, or placed upon any of the said footways of any such street or public place any waggon, cart, dray, sledge, or other carriage, or any wheelbarrow, handbarrow, or truck, or any hogshead, cask, or barrel, or shall wilfully drive, ride, or lead any horse, ass, mule or other beast upon any such footway, shall, upon conviction thereof, forfeit and pay for the first offence a sum not exceeding £2 nor less than 5s., for the second offence a sum not exceeding £5 nor less than 10s., and for a third and every subsequent offence a sum not exceeding £10 nor less than £1, for each such offence.

Placing goods, carriages, &c., on footways, not removing same when required—replacing same after removal—awnings to be excepted.

14. Any person who shall set or place, or cause or permit to be set or placed, any stall, board, chopping-block, show-board (on hinges or otherwise), basket, wares, merchandise, casks, or goods of any kind whatsoever, or shall hoop, place, wash, or cleanse, or shall cause to be hooped, placed washed, or cleansed any pipe, barrel, cask, or vessel, in or upon or over any carriage or footway in any street or public place within the said borough, or shall set out, lay, or place, or shall cause or procure, permit, or suffer to be set out, laid, or placed, any coach, cart, wain, waggon, dray, wheelbarrow, handbarrow, sledge, truck, or other carriage, upon any such carriage-way except for the necessary time of loading and unloading such cart, wain, waggon, dray, sledge, truck, or other carriage, or taking up or setting down any fare, or waiting for passengers when actually hired, or harnessing or unharnessing the horses or other animals from such coach, cart, wain, waggon, dray, sledge, truck, or other carriage—or if any person who shall set or place, or caused to be set or placed, in or upon or over any such carriage or footway any timber, stone, bricks, lime, or other material or things for building whatsoever (unless the same shall be enclosed as herein directed), or any other matters or things whatsoever, or shall hang out or expose, or shall cause or permit to be hung out or exposed, any meat or offal, or other thing or matter whatever, from any house or other building or premises, or any other matter or thing, from and on the outside of the front or any other part of any other house or other buildings or premises over or next unto any such street or public place, and shall not immediately remove all or any such matters or things being thereto required by the Inspector of Nuisances or other proper officer of the Council; or if any person who, having in pursuance of any such requisition as aforesaid remove, or cause to be removed, any such stall-board, show-board, chopping-block, basket, wares, merchandise, casks, goods, coach, cart, wain, waggon, dray, wheelbarrow, handbarrow, sledge, meat, offal, or other things or matters whatsoever (save and except as aforesaid) in, upon, or over such carriage or footway, of or next unto any such street or public place as aforesaid, shall, upon conviction for every such offence, forfeit any pay for the first

offence a sum not exceeding 40s. nor less than 5s.; for the second offence a sum not exceeding £5 nor less than 10s.; and for a third and every subsequent offence a sum not exceeding £10 nor less than £1: provided that nothing herein contained shall be deemed to prevent any person from placing an awning in front of his or her shop or house, in such manner as that such awning shall be at least 7 feet high above the height of the footway, and that the posts be placed close to the kerbstone or outer edge of such footway, and a plan of such awning submitted to the Council prior to its erection and approved of by such Council or any officer duly appointed for the purpose.

Riding on drays, careless driving, &c.

15. If the driver of any waggon, wain, cart, or dray of any kind, shall ride upon any such carriage in any street as aforesaid, not having some person on foot to guide the same (such carts as are drawn by one horse or driver or guided with reins only excepted), or if the driver of any carriage whatsoever shall wilfully be at such a distance from such carriage, or in such a situation whilst it shall be passing upon such street that he cannot have the direction and government of the horse or horses, or cattle drawing the same, or if the driver of any waggon, cart, dray, coach, or other carriage whatsoever meeting any other carriage, shall not keep his waggon, cart, dray, coach, or other carriage on the left or near side of the road, street, or thoroughfare, or if any person shall in any manner wilfully prevent any other person or persons from passing him or her, or any carriage under his or her care, upon such street, or by negligence or misbehaviour prevent, hinder, or interrupt the free passage of any carriage or person in or upon the same, every driver or person so offending shall, upon conviction, forfeit and pay any sum not exceeding £2.

Part V.

Nuisances.

Dead animals, &c., not to be thrown into any public watercourse, &c.

1. Any person who shall cast any filth, rubbish, or any dead animal, or any animal with intent of drowning, into any public watercourse, sewer, waterhole, river, creek, road, or pathway, or who shall suffer slops, suds, filth of any kind to flow from his or her premises into any such watercourse, waterhole, river, creek, or canal, or who shall permit or suffer any such slops, suds, or filth to flow from his or her premises over any of the footways or streets of the borough, or shall permit or cause, by means of pipes, shoots, channels, or other contrivances, filth of any kind whatsoever to flow into any public watercourse, waterhole, river, creek, or canal, shall forfeit any sum not exceeding £5 nor less than £2.

Dead animals—mode of removal.

2. If any animal shall die in any part of the said borough, and the owner of such animal or occupier of the place, if private property, where such animal shall have died, shall not cause such animal to be immediately destroyed by fire, or so effectually removed and disposed of that nuisance can possibly result therefrom in any part of the borough, he shall for every such offence forfeit and pay any sum not exceeding £50 nor less than £2.

Dead animals on road or street, &c

3 If any animal shall die on any road, street, or public place within the said borough, or within half-a-mile of any road, street, or public place, or any dwelling-house, and the owner of such animal, or the occupier of the place, if private property, where such animal shall have died, shall not immediately cause such animal to be effectually removed and destroyed as aforesaid, or removed as aforesaid, on the spot where it shall have died, if a quarter of a mile from any dwelling-house; or if such spot shall not be a quarter of a mile from any dwelling-house, or if such owner or occupier shall not immediately cause such animal to be effectually removed as aforesaid, or to be removed to some place not less than a quarter of a mile from any dwelling-house, and there destroyed as aforesaid, every such owner or occupier shall, for every such offence, forfeit and pay any sum not exceeding £10 nor less than £2.

Power of Inspector as to dead animals on private premises.

4. The Inspector of Nuisances or any other officer appointed by the Council of the said borough with his assistant may, at any hour, enter upon any premises or place within the said borough where any animal has died, and require the owner or occupier of such premises or place immediately to destroy such animal by fire, and if necessary to remove the same for that purpose, as such Inspector of Nuisances or other officer appointed by the said Council shall direct, or otherwise forthwith effectually to remove and dispose of the same as afore-said, in default of which it shall be lawful for any one or more of such officers to cause such animal to be removed for that purpose; and every owner or occupier of such premises or place failing, neglecting, or refusing to comply with such requisition shall forfeit and pay any sum not exceeding £30 or less than £3.

Dead animals in certain cases to be removed at cost of the municipality

5. If any animal should die in any public place or street within the said municipality, and the owner or any person having charge of such animal cannot at the time be found or ascertained, it shall immediately be removed by the Inspector of Nuisances or other officer appointed by the said Council and destroyed in manner aforesaid at the cost of the municipality.

Drains.

6. All drains whatsoever and the water-closets, earth-closets privies, cesspools, and ashpits within the borough of Narrandera shall be constructed so as not to be a nuisance or injurious to health, and so that there shall be no overflow, soakage, or leakage therefrom; and every cesspool within the said borough which shall be formed or made below the surface of the ground shall be also so constructed so as that the watertight walls or sides thereof shall project on all sides at least 6 inches above the surface of the ground in which such cesspools shall be formed or made.

Cleansing of privies and cesspits.

7. The occupier of any house, building, or tenement within the borough of Narrandera shall cause every privy, cesspool therein to be emptied and cleansed from time to time as soon as any portion of the contents of such cesspool shall have so accumulated therein as to be within a distance of 1 foot from the top of the wall, sides, or lining of such cesspool: provided that the contents of such privy shall not be removed or discharged therefrom except between the hours of 11 p.m. and 5 a.m.; and provided also that the contents of any privy or cesspool shall not be removed or discharged therefrom until such contents shall have been mixed therewith a quantity of chloride of lime, zinc, carbolic acid, common salt, or some other efficient deodorizer sufficient to effectually deodorize and disinfect the same.

Where cesspools are not provided.

8. The occupier of every house, building, or other tenement on or in which the privy or closet belonging thereto shall not be provided with a cesspool constructed in accordance with provisions of the preceding by-law, shall at all times cause to be kept in such privy or closet a supply of dry powdered earth or other deodorizing material as aforesaid, sufficient to thoroughly and effectually deodorize the contents of such bucket, pan, or other receptacle.

Erection of new closets.

9. Every person about to erect a closet or form a cesspit, shall before commencing any such work give to the Town Clerk seven days' notice in writing of his intention and of the proposed position of such closet or cesspit, and in default thereof, or in case of his commencing such work without such notice, he shall be liable to a penalty of not less than £1 or more than £5; and no such closet shall be erected or cesspit formed except in such position as shall be approved by the Inspector of Nuisances or other officer appointed by the Council, and any person being guilty of a breach of this by-law shall be liable to a penalty of not less than £1 nor more than £5.

Every tenement to have closet.

10. A separate closet shall be provided for every tenement. Any breach of this By-law shall render the person so offending liable to a penalty of not less than £1 nor more than £5.

Objectionable closets to be altered

11. If any alteration shall be required, in the opinion of the Inspector of Nuisances or any officer of the Council appointed in that behalf for preserving public health or decency, in the case of any existing cesspit or closet, the Inspector of Nuisances or other officer of the Council shall report the same to the Council, and if the Council shall adjudge such cesspit or closet to be injurious to health or opposed to decency, the same shall be altered by the occupier or owner of the premises upon which such cesspit or closet exists, after due notice has been served upon such owner or occupier; and should such owner or occupier neglect or refuse to alter the same, the Inspector of Nuisances or other officer appointed by the Council shall forthwith make the necessary alterations, and the cost of the same shall be paid by the owner or occupier of the premises wherein the same shall be.

The disposition of night-soil.

12. The place of deposit of night-soil shall be in such locality as may from time to time be determined by the Council and until otherwise provided by the Council, shall be disposed of as authorized by the Inspector of Nuisances.

Power to inspect any premises by Inspector of Nuisances.

13. The inspector or other officer appointed by the Council may visit and inspect any premises, or do any work authorized by the Nuisances Prevention Act, 1875, therein on all days except Sundays and public holidays, between the hours of 10 in the morning and 4 o'clock in the evening.

Prohibition of use of night-soil.

14. No person shall be at liberty without the permission of the Council or the Inspector of Nuisances or other officer of the Council appointed on that behalf, to use on his own premises any night-soil brought from elsewhere; and any person committing a breach of this By-law shall be liable to a penalty of not less than £2 nor more than £10.

Burial of night-soil.

15. Every person shall be at liberty to use on his own premises all night-soil collected thereon by burying the same at least 2 feet in the earth; but if any nuisance shall arise therefrom he shall be liable to a penalty of not less than £1 and not more than £5.

Inspector of Nuisances Report.

16. It shall be the duty of the Inspector of Nuisances to furnish the Council with a report, every three months, containing a list of persons proceeded against for nuisances within this borough, specifying the dates, and giving particulars of each case.

Cost of emptying cesspits, &c

17. The Council may, after due application, recover such sums for the emptying of cesspits or attendance on earth-closets at such rates as may from time to time be decided upon and fixed by the Council to be charged in respect of such services.

Maximum and minimum penalties where not otherwise provided for.

18. In any case where no special penalty is fixed in these By-laws for any breach of the same, the maximum penalty for any such breach shall be £20 and the minimum £1, unless otherwise provided for by the Nuisances Prevention Act, 1875.

Cleansing butchers' shambles, &c.

19. For preserving the cleanliness of the said borough and the health of the inhabitants thereof, it shall be lawful for the Inspector of Nuisances or any other officer or officers appointed by the Council from time to time, and when and as often as he or either of them shall see occasion to visit and inspect the butchers' shambles, slaughtering-houses, boiling-down establishments, tanneries, fellmongeries, and soap works in the said borough, and to give such directions concerning the cleansing of said shambles, slaughter-houses, tanneries, soap works, and establishments, both within and without as to him shall seem needful; and any butcher, or the owner or occupier of any such shamble, slaughter-house, tannery, soap works, or establishment, who shall refuse or neglect to comply with such directions within a reasonable time, shall forfeit and pay a sum not exceeding £10 nor less than 10s.

Complaints respecting dirty premises, &c.

20. Upon the complaint of any householder that the house, premises, yards, closets, or drains of the neighbouring or adjoining premises are a nuisance or offensive, the Inspector of Nuisances or any other officer appointed by the Council, shall make an inspection of the premises complained of, and the officer of the said Council shall have the full power without any other authority than this By-law to go upon such premises for the aforesaid purpose; and any person who shall personally, or by any person in his employment or under his control, suffer any waste or stagnant water, or any muck, filth, soil, or other offensive matter in any cellar or place within any dwelling-house or premises within the said Borough, or shall in like manner suffer the contents of any water-closet, privy, or cesspool to overflow or soak therefrom, shall for every such offence forfeit and pay a sum not exceeding £5 nor less than £1.

Various obstructions and annoyances.

21. Every person who in any street or public place or passage within the said borough to the obstruction, annoyance, or danger of the residents or passengers, shall commit any of the following offences shall, on conviction for any and every such offence, forfeit and pay a penalty of not more than £2.

(1.) Every person who shall hoist or cause to be hoisted, or lower or cause to be lowered, goods of any description from an opening in any house fronting any street or public place, and close to the footway thereof, without sufficient and proper ropes and tackling.

(2.) Every person who shall carry or convey, or cause to be carried or conveyed, in any street or public place, the carcass or any part of the carcass of any newly slaughtered animal, without a sufficient and proper cloth covering the same for the concealment from public view, or shall hawk or carry about butchers' meat for sale without covering the same as aforesaid.

(3.) Every person who shall place any line, cord, or pole across any street, lane, or passage, or hang or place clothes thereon, or allow any tree or shrub overhanging the footpath to the danger or annoyance of any person.

(4.) Every person who shall place any flower-pot in any upper window near to any street or public place without sufficiently guarding the same from being thrown down.

(5.) Every person who shall throw or cast from the roof or any part of any house or other building, any slate, brick, part of a brick, wood, rubbish, or other material or thing (unless within a hoard or enclosure) when any house or building is being erected, pulled down, or repaired.

(6.) Every blacksmith, whitesmith, anchor-smith, nail-maker, metal-founder, lime-burner, brickmaker, potter, or other person using a forge, furnace, or kiln, and having a door, window, or aperture fronting or opening into or towards any street, lane, or passage, and not enclosing such door, or not fastening the shutters or other fastenings of such window and closing such aperture, or placing a screen before the same every evening within one hour after sunset, so as effectually to prevent the light from showing through the doorway, window, or aperture next or upon such street, lane, or passage.

(7.) Every person who shall within the distance of 100 yards from any dwelling-house burn any rags, bones, cork, or other offensive substance, to the annoyance of any inhabitant.

(8.) Every person who shall carry goods or any frame to the annoyance of any person upon the footway of any street or other public footway.

(9.) Every person who shall be the keeper of or have any dog or other animal, which shall attack or endanger life or limb of any person who may have the right-of-way or use of any private yard, alley, street, or any other place within the said borough.

(10.) Any person who shall breed, feed, or keep any kind of swine in any house, yard, or enclosure, situate and being in or within 40 yards of any street or public place within the borough, or shall suffer any kind of swine, or any horse, ass, cattle, mule, sheep, goat or any other animal of the like nature, belonging to him or her, or under his or her charge, to stray or go about, or to be tethered or depastured in any street or public place within the borough, shall forfeit and pay for every such offence a sum not exceeding £2, and to be made liable for damages.

No rock &c., to be blasted without notice and permit.

(11.) Any person who shall be desirous of blasting any rock or other similar substance within 100 yards of any street or public place or dwelling-house in the said borough, shall give notice in writing twenty-four hours previously to the Council Clerk, who shall appoint a time when the said blasting shall take place, and the said officer shall give such other directions as he may deem necessary for the public safety; and if any person shall blast or cause to be blasted any rock within the limits aforesaid without giving such notice, or shall not conform to the directions given him by the said Town Clerk or other duly appointed officer by the Council, he or she shall, on conviction, forfeit and pay for every such offence any sum not less than £1 nor more than £5.

Premises in state to endanger public health.

House to be purified on certificate of two medical practitioners.

22. If upon the certificate of any two duly qualified medical practitioners it appear to the Council that any house or part thereof, or the premises occupied in connection therewith within the limits of the said borough, is in such a filthy state or unwholesome condition, that the health of any person is, or may be liable to be affected or endangered thereby, and that the white-washing, cleansing, or purifying of any house or part thereof, or the premises occupied in connection therewith would tend to prevent or check infectious or contagious disease, the said Council would give notice in writing to the owner or occupier of such house or part thereof, or the premises occupied in connection therewith, to whitewash, cleanse, or purify the same, as the case may require; and if the person to whom the notice is so given shall fail to comply therewith within such time as will be specified in the said notice, he shall be liable to a penalty not exceeding 10s. for every day during which he continues to make default: provided that no such penalties shall collectively amount to any greater sum than £20.

Offences against public decency.

Bathing prohibited within certain limits.

23. Any person who shall bathe near to or within view of any inhabited house, or of any public wharf, bridge, street, road, or other place of public resort within the limits of the said borough, between the hours of 6 in the morning and 8 in the evening, shall, on conviction, forfeit and pay a sum not exceeding £1 for every such offence.

Penalty on indecent exposure of the person.

24. Any individual who shall offend against decency by exposure of his or her person in any street or public place within the said borough, or in the view thereof, shall, on conviction, forfeit and pay for every such offence a sum not exceeding £10 nor less than £1.

Houses of ill-fame.

25. Upon representation of any respectable ratepayer that any house or premises within the borough and near to the residence of such ratepayer, is of ill-fame, it shall be lawful for the By-law Committee to cause the residents of such house or premises to furnish to the Council a list of names, ages, sexes, and occupations of all the inmates of the said house or premises; and upon non-compliance with such request, or, if upon consideration, the said Committee consider the house to be of ill-fame, they shall, with the sanction of the Council, declare the same to be a nuisance, and shall cause a notice in writing to be served upon the holder of such house or premises, or any person resident or being therein, to discontinue or abate the said nuisance within forty-eight hours after the receipt of such notice; and if such nuisance be not abated the holder of such house or premises or other person residing or being therein and acting as such holder, shall be liable to be proceeded against for such nuisance, and shall, on conviction thereof, forfeit and pay any sum not less than £2 nor more than £20; and if such nuisance shall not be abated within forty-eight hours after such conviction, such holder of such house, or such other person residing or being therein as aforesaid, shall forfeit and pay for such second offence a sum not less than £5 nor more than £50; and if a further period of forty-eight hours shall elapse after such second conviction without the abatement of such nuisance, such holder of such house, or other person residing or being therein as aforesaid, shall for such third offence forfeit and pay a sum not less than £10 nor more than £50.

Noisome and offensive trades.

No noisome or offensive trade to be carried on to the injury of any inhabitants.

26. No person shall carry on any noisome or offensive trade within the said borough so as to injure or to be a nuisance as hereinafter stated, to the inhabitants thereof.

Definition of "noisome and offensive trades."

27. Any manufacture, trade, calling, or operation in the conducting, following, or carrying on of which, or in consequence of, or in connection wherewith, or from the premises where the same is conducted, followed or carried on, any gas, vapour, effluvia, or smoke, shall be calculated to injure animal or vegetable life, or in any other way to injure or to be a nuisance to the inhabitants of the said borough, shall be considered a noisome and offensive trade within the meaning of these By-laws.

Complaint, injury and report—Order of Council taken thereon—Notice to discontinue, &c.—Penalty.

28. Upon complaint in writing by any householder that any noisome or offensive trade is being so followed, conducted, or carried on in the vicinity of his or her residence or property, so as to injure his or her health, or the health of any member of his or her family, or to be a nuisance to such householder and to his or her family, the Inspector of Nuisances or any other person or persons appointed by the Council shall make an inspection of the premises where such trade is alleged to be so conducted, followed, or carried on as aforesaid, and of the premises or property of the complainant, and shall inquire into the grounds for such complaint and shall report thereon to the Council; and if the said Council shall, on consideration of such report, or after any such further inquiry as may be deemed necessary, be of the opinion that the said complaint is well founded, and that any manufacture, trade, calling or operation so complained of and so being conducted, followed or carried on as aforesaid is a "noisome and offensive trade" within the meaning of these By-laws, notice shall be given to the person or persons conducting, following, or carrying on such trade, to cease and discontinue the same within such reasonable time, not being less than thirty days nor more than sixty days as the said Council may direct; or so to conduct, follow, or carry on his, her, or their manufacture, trade, calling, or operation as that within such reasonable time as aforesaid, the same shall wholly and permanently cease to be noisome and offensive within the meaning of these By-laws, either to the said complainant or to any other resident within the borough; and if such trade be not discontinued as aforesaid, or shall not be so conducted as that it shall wholly cease to be noisome and offensive as aforesaid, within the time named in such notice as aforesaid, any person conducting, following, or carrying on such trade as aforesaid, shall, for the first offence, forfeit and pay a sum not less than £2 or more than £5; for a second offence a sum of not less than £5 nor more than £20; and for the third and every subsequent offence a sum not less than £10 nor more than £50.

Mode of proceeding when noisome and offensive trade is about to be commenced—penalty.

29. The like proceedings shall be taken as aforesaid, whenever there shall be a complaint as aforesaid that any manufacture, trade, calling, or profession, is about to be commenced or entered upon which is likely to prove noisome and offensive within the meaning of these By-laws, save and except the notice to be given as aforesaid shall be given to the person or persons about to commence or enter upon such manufacture, trade, calling, or profession, and shall require him, her, or them not to commence or enter upon the same, or to take such measures as shall effectually and permanently prevent the same from becoming noisome or offensive within the meaning of these By-laws, to any resident within the borough; and any person who shall in any case commence, enter upon, or continue any such manufacture, trade, calling, or operation, so that the same shall be in any way noisome or offensive within the meaning of these By-laws, shall, for every such offence, forfeit and pay a sum of not less than £10 nor more than £50.

Service of notice—liabilities.

30. Service of any such notice as aforesaid upon the owner or occupier of any premises or land, wherein or whereupon any such manufacture, trade, calling, or operation is being conducted, followed, or carried on, or is about to be commenced or entered upon, or at the last-named place of abode of such owner or occupier, or upon any person of the said premises or land, shall be a good and sufficient service of such notice for all the purposes of these By-laws; and every person who shall be actually engaged in superintending, directing, or managing, or who shall be in any other way actually engaged or employed in any such manufacture, trade, calling, or operation as aforesaid, shall be liable to be regarded and treated as a person conducting, following, or carrying on such manufacture, trade, calling, or operation within the meaning, and for all the purposes of these By-laws.

Part VI.

Public Exhibitions.

Exhibitions, &c., to be licensed.

1. No exhibition, other than exhibitions licensed by the Colonial Secretary, under the provisions of the Act 14th Victoria No. 23, or exhibitions of a temporary character hereinafter specially provided for, shall be held or kept for hire, or profit within the said borough; nor shall any bowling alley, dancing saloon, or other place of public amusement, other than a place licensed as aforesaid, or a place of temporary amusement hereinafter specially provided for to be used as such for hire or profit within the said borough, unless, and until the same shall be duly registered, as hereinafter prescribed.

Temporary license by Mayor—penalty for exhibiting, &c., without license.

2. It shall be lawful for the Mayor, by writing under his hand, and without charge to permit any such exhibition as aforesaid (other than an exhibition requiring to be licensed by the Colonial Secretary under the said Act) and which shall not be held or kept for more than one week, and in like manner to allow any place within the said borough to be used for purposes of public amusement other than entertainments requiring to be licensed as aforesaid for not more than one week; provided that it shall be incumbent on such Mayor to inquire strictly as to the nature of such proposed exhibition or amusement before granting permission, and to refuse such permission if it shall appear that such proposed exhibition or amusement is of such a nature as to require to be licensed by the Colonial Secretary as aforesaid, or if there shall be reasonable cause for believing that such exhibition or amusement will be likely to entail any violation of public decency, to endanger the public place, or to be a nuisance to any inhabitant of the borough; every person holding or keeping any such exhibition, or using any place within the said borough for public amusement as aforesaid, or causing or permitting any place to be so used without such permission of such Mayor, shall forfeit and pay a sum not less than 5s. or more than £2 for every day that such exhibition shall be so held or kept, or such place shall be so used for public amusement as aforesaid.

Public buildings, &c., to be registered.

3. Every occupier of any building or ground in which any exhibition is held or kept, or any public amusement conducted as aforesaid, shall in each year register at the office of the Council, such building or ground, together with the situation and description thereof, and of the exhibition proposed to be held or kept, or the public amusement proposed to be conducted as aforesaid, in or upon such building or ground, and the name of such occupier; and every person who causes every occupier of any such building or ground, who permits any such exhibition to be held or kept, or any public amusement to be conducted for a longer period than one week, in or on any such building or land, not being registered for the purpose, or without such certificate of registration as hereinafter mentioned having been obtained for the same, shall forfeit for every such offence any sum not less than £1 or more than £20.

Certificates of registration.

4. The Council, upon the written application of any such occupier as aforesaid, stating the particulars as aforesaid; and if upon inspection by the proper officer, the building or land shall have been found to be secure and proper for the purpose stated; and if the proposed exhibition or amusement shall not be such as to require a license from the Colonial Secretary as aforesaid, and shall not be thought likely to entail any violation

of public decency, or to endanger the public peace, or to be a nuisance to any inhabitant of the said borough; the said Council shall cause the aforesaid premises to be registered in a registry book to be kept for that purpose, and shall thereupon grant to the applicant a certificate of such registration of such premises; and the said Council may at any time, and for any of the causes hereafter mentioned, suspend for a stated period the effect of or cause of any such registration, and shall forthwith give notice of such suspension or cancellation to the occupier of the registered building or land, and during such suspension, and after such cancellation of such premises shall be deemed to be unregistered in respect to the purpose mentioned in the certificate of registration, and such certificate shall be of no force or virtue.

Inspection.

5. The proper officer of the Council may at all reasonable times enter into or upon and inspect any such registered building or land.

No exhibition, &c., on Sundays, &c.

6. No such exhibition or place of public amusement as aforesaid shall be held or kept open or used for the purposes of such public amusements, on Sunday, Christmas Day, or Good Friday; and every person offending against this By-law in this behalf, shall, on conviction, forfeit and pay a sum not exceeding £5 nor less than £2 for every such offence.

Registration fee.

Time for which registration shall be in force.

7. For every such registration as aforesaid, the occupier of the building or land so registered shall pay to the Council Clerk, for the benefit of the said borough, a fee of £1; and every such registration, whenever the same may be made, shall be in force until the 31st day of December then next ensuing and no longer.

Certificate of registration to operate as license for exhibition, &c, named therein, and no other.

8. The certificate of registration aforesaid shall be regarded as a license from the Council for the holding or the keeping of the exhibition, or for carrying on of the public amusements therein mentioned, but for none other; any occupier of such building or land who shall hold or keep therein or thereon any exhibition, or shall use any building or land for any public amusement other than such exhibition or amusement mentioned in such certificate or license; shall for every such offence forfeit and pay a sum not less than 10s. nor more than £10.

Unlawful games and exhibitions.

9. No license shall be granted as aforesaid to or for any building or land wherein or whereon any games with dice or other games of chance for money, or any bull-baiting, dog-fighting, cock-fighting, or other exhibitions or amusements opposed to public morality or involving cruelty to animals or likely to cause any breach of the peace are proposed to be had or carried on; and the occupier of any building or land so registered as aforesaid who shall permit any such game of chance, or exhibition or amusement as are in the section beforementioned to be had, held, or carried on, in, or upon such building, shall, for every such offence, forfeit and pay a sum not less than 10s. nor more than £10.

Suspension or revocation of license.

Notice to be given and licensee to be allowed to show cause.

10. The effect of any such registration as aforesaid may be suspended, or such registration may be cancelled, as the Council may think fit, for any of the following causes, namely —Whenever the occupier of the registered building or land, or the manager of any such exhibition or amusement as aforesaid, held, kept, conducted, or carried on, in, or upon such building or land shall have been twice convicted of offences against these By-laws within a period of twelve months, or whenever it shall be shown to the satisfaction of the said Council that the superintendent, manager, director, or other person in charge of any such exhibition or amusement is a confirmed drunkard, or that such exhibition or amusement is being conducted in such a manner as to violate public decency, to endanger the public peace, or to become a nuisance to any inhabitant of the said borough: provided that before any such suspension or cancellation as aforesaid the occupier of such registered building or land shall have notice of the fact that the said Council is about to consider whether there shall be any such suspension or cancellation, and of the causes of this proceeding, and shall be allowed to show cause against such suspension or cancellation before the same shall be ordered.

Construction of term "occupier"—change in occupancy—false statement.

11. Any person who shall superintend, direct, or manage, or shall be otherwise in charge of any such exhibition or public amusement as aforesaid, in or upon any such building or land as aforesaid, or who shall reside in or upon any such building or land, wherein or whereon any such exhibition or public amusement shall be held, kept, or carried on, or who, being the owner, lessee, or tenant of any such building or land, shall permit the same to be used for the purposes of any such exhibition or public amusement, shall be deemed the occupier of such building or land for all the purposes of these By-laws; and the said By-laws shall be held to be as applicable in every case to any number of such occupiers as to any single occupier; and every such occupier whose name shall have been so registered as aforesaid shall be deemed and taken to be, and continue to be such occupier for all the purposes of these By-laws: provided that in the event of any change in the occupancy of any such building or ground as aforesaid, it shall be competent for the parties concerned to notify the same by writing under their hand to the said Council Clerk, who shall lay such notification before the Council at its next sitting; and if after such inquiry as such Council may deem necessary, there shall seem to be no valid objection to such change of occupancy, a corresponding entry shall be made in the registry aforesaid, and a new certificate shall be issued, which shall be in force until the next ensuing 31st day of December and no longer; and for every such new certificate a fee of 5s shall be paid to the said Council Clerk for the benefit of the said borough; and any person who shall make any false statement in any such application or notice as aforesaid, as to any of the facts or particulars required by these By-laws, to be stated in such application or notice, shall for every such offence forfeit and pay any sum not less than £1 nor more than £20.

Wilful trespass.

12. Every person who shall wilfully let in or knowingly suffer to enter upon the reserves or public recreation ground any animals without due authority, shall be deemed guilty of wilful trespass, and shall be liable for every such offence to a penalty not exceeding £20 nor less than £2.

Penalty for destroying boundary-marks.

13. Any person pulling down, defacing, or injuring any marks, or any fence or other erection without the authority of the Council, shall forfeit and pay any sum not exceeding £10 nor less than £1

Part VII.

Public and private property.

Erection of houses, &c.

1. No person shall be permitted to erect any house, shop, or other building in any street, lane, or place in the borough without first serving notice in writing on the Mayor or Council Clerk, on any lawful day between the hours of 8 o'clock a.m. and 8 o'clock p.m., stating such intention, and describing the proposed situation of the building or erection, and without having received an authority from the Mayor or Council Clerk, who shall give the required level and alignment if in a proclaimed street, on a payment of a fee of 5s. No person shall be at liberty to encroach beyond the building-line in any street or lane by the erection of houses, verandahs, doorsteps, fences, or any other obstruction whatever.

Houses, &c., to be spouted.

2. All proprietors of houses within the Municipality having a frontage to any main thoroughfare shall be bound to have the same sufficiently spouted with down-pipe, to be carried under the surface of the footpath into the gutter, under a penalty of 10s. on conviction; and if not remedied at the expiration of seven days after such conviction, the offender shall be again liable to a like conviction and penalty also for every succeeding seven days.

Using bark for building in the main thoroughfare.

3. No person shall erect any building of bark, nor roofed with that material or with calico, within the populous parts of the town, except by express permission of the Council, and then for a temporary purpose only; any person so offending shall on conviction, be liable to a penalty not exceeding £10, to be recovered in a summary way, and shall be bound to remove the aforesaid building within such period as the Council may determine.

Injuring or extinguishing lamps.

4. Any person who shall wantonly or maliciously break or injure any lamp or lamp-post, or extinguish any lamp set up for public convenience in the said borough shall, over and above the necessary expense of repairing the injury committed forfeit and pay for every such offence any sum not less than £1 nor more than £5.

As to damaging buildings.

5. Any person who shall damage any public building, toll-gate, toll-bar, toll-board, wall, parapet, fence, sluice, bridge, culvert, sewer, watercourse, or other public property within the said borough, shall pay the cost of repairing the same, and if such damage be wilfully done shall forfeit and pay a sum not exceeding £20 nor less than £5.

Affixing placards on walls, &c.

6. If any person or persons shall paste, or cause to be pasted, or otherwise affix any placard or other paper, or chalk or paint upon any wall, fence, culvert, kerbstone, footway, handrail, or any other property of the Council, shall forfeit and pay for every such separate offence a sum not exceeding £5 nor less than £1.

Damaging trees.

7. Upon any ratepayer applying to the Council to have trees planted opposite his or her property, on any street or road within the borough, and such ratepayer paying to the Council the sum of 10s. for each tree, the Council may direct the Works Committee to have such trees planted at the cost of the Council.

Obstructing public pathways.

8. That the owner or occupier of any land situate on the side of any street or road in this borough, who shall permit any tree, shrub, or plant, kept for ornament or otherwise, to overhang any path or footway on the side of any such street or road, so as to obstruct the passage thereof, and who on demand made by the Council, or their overseer or inspector, shall not cut, or cause to be cut, lopped, or cause to be lopped, all such trees, shrubs, plants, to the height of 8 feet at least; the said Council and their servants, labourers, and workmen, may cut or cause to be cut or lopped all such overhanging trees, plants, shrubs, and to remove or burn any portion of such trees, plants, shrubs, so cut or lopped without being deemed a trespasser or trespassers, and in case any person or persons shall resist, or in any way forcibly oppose the said Council or their servants, labourers, or workmen, in the due execution of the powers given in this behalf by virtue of the Municipalities Act of 1867. Every person so offending shall, on conviction for every such offence, forfeit and pay any sum not exceeding £10.

Neglecting to keep clean private avenues.

10. Any owner or occupier of any house or place within the said borough who shall neglect to keep clean all private avenues, passages, yards, and ways within the said premises, so as by such neglect to cause a nuisance by offensive smell or otherwise, shall, on conviction, forfeit and pay a sum not exceeding £2 nor less than 10s. for every such offence.

Part VIII.

By-laws for the regulation of public vehicles; for the regulation and licensing of public carriers, waterdrawers, and public vehicles, omnibuses, cars, cabs, hackney carriages, water-carts, drays, carts, or vans, and the drivers and conductors of passenger carrying vehicles.

Vehicles to be licensed.

1. No vehicle shall ply or be used for hire within the borough of Narrandera, unless the same be duly licensed in the manner herein described.

Requisition to be made for license.

2. Before any license for plying a vehicle, or to drive or to conduct the same shall be granted, the party requiring such license shall obtain from the Council Clerk, free of charge, a requisition in the form of the Schedule hereunto annexed, marked with the letter A, or to the like effect, and duly fill up and sign the same and deliver it to the Council Clerk, and in the case of drivers or conductors shall also obtain a certificate from two respectable householders to the effect that the applicant is of good character, and competent to act as such driver or conductor, as the case may be.

Condition under which licenses to be granted.

3. No license shall be granted in respect of any vehicles which, in the opinion of three Aldermen, who shall be appointed by a resolution of the Council of the said borough, is unsafe, or in bad repair, or otherwise unfit for the accommodation and conveyance of passengers therein, nor until the number of such vehicle be painted thereon on a plate or plates affixed thereon, outside on the panel of each door of such vehicle, or on such other place or places, and in such manner as the said three Aldermen may direct.

Licenses, and how to be issued.

4. Licenses for proprietors, drivers, and conductors of vehicles shall be in the form contained in the Schedule hereunto annexed, marked with the letter B, or the like effect; and any person plying, driving, or conducting any vehicle for hire with passengers without such license shall be deemed guilty of a breach of these by-laws.

Licenses to be under Corporate Seal.

5. Every license granted under these by-laws shall be under the common seal of the Borough Council of Narrandera, and signed by the Mayor, and countersigned by the Council Clerk, upon the production of a certificate signed by the Aldermen who shall be appointed as aforesaid, and shall be in force from the date of such license until the 31st day of December next ensuing, subject to the conditions in section 10, and no such license shall include more than one vehicle; provided that where the licensed vehicle shall be under repair, if the proprietor shall so desire, he may be permitted to substitute another for a period to be then specified, and endorsed on the license signed by the Mayor, and countersigned as aforesaid.

Age of drivers.

6. No license shall be granted to any person to drive any passenger-carrying vehicle who shall be under the age of 18 years.

Vehicles, &c., plying for hire to be licensed.

7. All water-carters, firewood-carters, and owners of vehicles plying or carrying passengers, goods, or other materials for hire shall be licensed by the Council, and the owners shall have their names painted in legible letters, with the words "licensed" on some conspicuous part of such vehicles respectively; the license fee shall be at the rate of 10s. per week per annum, and all such licenses shall be issued for a period of twelve months, terminable on the 30th day of June in each year and every owner who shall omit or fail to comply with the provisions of this by-law, shall forfeit a sum not exceeding £2 nor less than 10s.

Legal proceedings against offenders.

8. The Inspector of Nuisances or other person appointed by the Council may take legal proceedings against any person or persons committing any offence against any of the by-laws of the said borough.

Licenses not to transfer.

9. No proprietor shall be at liberty to part with or lend his license, nor to part with his licensed vehicle to any person without the knowledge and approval of the Mayor, and the registry of the same of the purchaser in the books of the Town Clerk, and on the license granted for such vehicle, and any proprietor who shall part with his vehicle without such approval and registry, shall be deemed the proprietor thereof, and subject as such to all the provisions of this by-law as fully as if no change of ownership had taken place, and the purchaser of such vehicle who shall allow the same to be used or to ply for hire without such approval and registry shall be subject to the same penalty as is imposed by this by-law on a person plying without a license.

Licensee to be deemed owner.

10. The person or persons in whose name or names a license shall appear to have been obtained shall be deemed the owner of the vehicle in respect of which the same shall have been taken out.

Revocation of license.

11. The license of the proprietor, driver, or conductor of any vehicle may be revoked or suspended by the Mayor as he shall deem right, after three days' notice in writing, given to such proprietor, driver, or conductor, to show cause why the same should not be revoked or suspended, and opportunity thereupon given to show such cause in case either the proprietor, driver, or conductor shall have been convicted of two offences against this part of these by-laws, committed within a period of eight months next proceeding.

Driver not to part with license.

12. No driver or conductor of a licensed vehicle shall lend or part with his license, nor shall the proprietor of any such vehicle employ any unlicensed person as the driver or conductor thereof.

By-law Committee to have power to inspect all licensed vehicles.

13. The By-law Committee shall, as often as they may deem it necessary, cause an inspection to be made of all licensed vehicles, or of any such vehicles, and of the harness and horses used in drawing same, and if any such vehicle, horse or horses or harness, should at any time be found by them unfit for public use, notice in writing of the same shall be given to the proprietor of such vehicle, and if after such notice he shall let or hire such vehicle, or suffer the same to be used or hired until the same, as the case may require, be in a condition for public use, the said Committee may suspend for such time as they may think proper the license of such vehicle; and in case any person shall neglect or refuse to attend with his licensed vehicle before the said Committee when called upon for that purpose so to do (viz., the inspection of their licensed vehicle), the said Committee may suspend the license of such vehicle.

Number of license to be painted on vehicles.

14. The number of any license granted for any omnibus or car shall be painted outside on the panel of the door or doors, or on a plate or plates affixed thereto, in figures not less than 4 inches in height, and for every hackney carriage or cab, in figures not less than 2 inches in height, and of proportionate breadth, and also shall paint such number upon each lamp

used in or upon such vehicle as the By-law Committee may direct, and such numbers shall be kept legible and undefaced during all the time such vehicle shall ply or be used for hire.

Penalty for refusing to pay hire of licensed vehicles.

15. No proprietor or driver of any licensed hackney carriage, having agreed to take any fare at any time from or to any place, shall delay or neglect or refuse to do so, and failing so to do will render himself liable to a penalty of £1; or any person having hired a licensed hackney carriage and not paying the legal fare when demanded, shall, on conviction, forfeit and pay the owner or driver of such carriage such fare, together with such further sum for damages, costs, and expenses for loss of time or otherwise, as the convicting Justices shall, in their discretion, think proper.

Drivers of public vehicles on "stand" compelled to take fare.

16. Every proprietor or driver of a hackney carriage or cab standing or plying for hire at any public stand appointed by the Council, shall be deemed disengaged, and be bound accordingly to take immediately any fare, notwithstanding any previous engagement: provided, however, that no such proprietor or driver shall be bound to take such fares unless the person requiring the same shall, upon demand, tender and pay the legal fare there and then.

Names of proprietors and destination of omnibuses to be painted thereon.

17. No omnibus shall be used or employed within the Municipality unless there shall be painted in words at length and in legible and conspicuous letters, 2 inches at the least in height and proportionate breadth, and in a colour opposite and different to the colour of the ground on which such letters shall be painted upon some conspicuous part of such omnibus, and clear of the wheel or wheels thereof, so that the same shall be at all times plainly and distinctly visible, the christian and surname of the proprietor of such omnibus or car, and also the names of the extreme places from which and to which such omnibus or car shall be licensed to travel or go and these only; and no person shall use or employ for hire any omnibus upon which any of such particulars are obliterated or placed.

Number of persons, &c., licensed to be carried to be painted on vehicle.

18. No omnibus shall ply for hire within the said borough unless there shall be painted the number of the license of such vehicle and the number of persons such vehicle is licensed to carry according to these by-laws in words at length, in the following form, that is to say, "licensed to carry" inside and outside, together with the length of time of the journey is to be performed in from stand to stand, as shall be determined from time to time by resolution of the Council, published and required by the by-laws of the said borough, the same to be painted in legible letters, white upon a ground of black, at least 2 inches in length and of proportionate breadth on the outside, and on a plate 6 inches by 3 in clear legible letters on the front panel inside, or in such other places as the By-law Committee may direct; and no driver or conductor of any such omnibus or car shall carry in or upon such omnibus or car a greater number of persons than the number so painted thereon, nor ply from or to any other stand than those aforesaid painted on such vehicle, to and from which they are licensed to travel or go; nor shall such driver or conductor permit or suffer any person except the conductor to be on the footsteps at the back of such omnibus: provided that when any omnibus shall be altered in size or colour, or line of road, it shall be brought for inspection to the Council Chambers, and the alteration shall be made by indorsement on the license, signed by the Mayor and countersigned by the Council Clerk.

Regulation as to number to be carried in omnibus, &c.

19. No omnibus shall be allowed to carry at one time a greater number of passengers in the whole, or in the inside, or on the outside thereof, than the same will contain at one time upon fit and proper seats provided therein or thereupon for that purpose, allowing for every passenger on an average upon each and every seat a space convenient for sitting thereon of 18 inches, measuring in a straight line lengthwise on the front of each seat, and each such inside seat shall be 2 feet apart from the outer edge thereof: provided no child under 5 years of age sitting on the lap shall be deemed to be a passenger in the meaning of these by-laws.

Misconduct of drivers, &c.

20. No driver or conductor of any licensed vehicle shall, whilst driving, loading, or unloading, or attending any vehicle, wilfully or negligently do or cause to be done any damage to the person or property of any person, or be guilty of intoxication, or of any breach of the peace, misconduct, misbehaviour, or make use of any threatening, obscene, blasphemous, abusive, or insulting language, sign, or gesticulation.

Mode of setting down passengers.

21. Every driver, whilst engaged in taking up or setting down any passenger, shall, during such taking up or setting down, place his vehicle as near as conveniently may be to that side of the street, and at a line with the kerbstone or edge of the footpath at which the taking up or setting down is required.

Pace which all public vehicles to be drawn.

22. No licensed vehicle shall be drawn at a pace faster than that commonly known as trotting; and in the event of a conviction of any driver for a breach of this by-law his license may be cancelled by the Mayor.

Persons suffering from contagious diseases not to ride in public vehicles

23. No person suffering from any infectious or contagious disease shall ride in or upon any licensed vehicle, and no driver or conductor shall knowingly carry or permit to be carried any such person, or (except to some police-office or watchhouse) any corpse, or any person in a state of intoxication, or who is so noisily or violently conducting himself or otherwise so misbehaving as to occasion any annoyance or to disturb the public peace; and no passenger shall carry inside of any licensed vehicle any noxious animal, or any substance of an offensive character, or anything that might soil or damage the vehicle or the apparel of other passengers; and no conductor or driver shall sleep in or upon any licensed vehicle, or use the same for eating his meals therein.

Lamps.

24. Every licensed vehicle shall be provided with a lamp on each side of the same outside, and the driver of such vehicle when plying for hire between sunset and sunrise shall light and keep such lamps lighted, and also keep a properly lighted lamp in the inside of every such vehicle during the time aforesaid, and in such a position as the Inspector or any other qualified officer of the Council may direct; and every lamp used on the outside of such vehicles as aforesaid shall be such and so placed as to appear white on the front and outsides and red behind.

Vehicles and fittings to be kept in good condition.

25. The proprietor of every licensed vehicle shall at all times when plying or employed for hire have the same in good order, with the harness perfect and in good order, and the glasses and frames of such vehicle whole, and the leathers attached to the frames of sufficient length, and the inside of the vehicle clean and wholesome and in good and substantial repair, and the whole ready and sufficient for duty, with driver and conductor, and horses competent to travel in due and reasonable time.

Smoking by driver, &c., not permitted.

26. No driver or conductor shall smoke any pipe or cigar whilst driving or conducting any licensed vehicle engaged in any fare, nor shall any passenger smoke inside or on any vehicle without the permission of the driver or against the wish of any passenger.

Property left in any public vehicle—disposition of.

27. All property left by any passenger in any licensed vehicle shall be given up to the conductor of such vehicle, if there be no conductor to the driver thereof, upon pain of a penalty not exceeding £20, to be paid by any person refusing or neglecting to give up such property belonging to another person; and such conductor or driver of any such vehicle who respectively shall find in a carriage any property so left shall within one day next after the same shall have been so given up or found carry such property in the state in which the same shall have come to his hand to the office of the Council, and deposit and leave such property with the Town Clerk; and every conductor or driver offending against this section shall forfeit a sum not exceeding £20.

Record to be kept of all property found in vehicles.

28. The Town Clerk with whom any such property shall be deposited shall forthwith enter in a book to be kept by him at the said office for that purpose the description of such property, and the name and address of the conductor or driver who shall have brought the same, and the day on which it shall have been brought; and the property so entered shall be returned to the person who shall prove to the satisfaction of the Council that the same belonged to him, such person previously paying all expenses incurred, together with any reasonable sum to such conductor or driver as with reference to the value of the property in question the Council shall award: provided that if such property shall not be claimed by and proved to belong to some person within one year of the same shall have been so deposited, the same shall be advertised in such manner as the Council may direct, such property shall be delivered up to the conductor or driver who deposited the same, provided that he shall apply for the same within one month after the expiration of one year; and in default of such application the Council shall cause such property to be sold, and the proceeds thereof shall be carried to the credit of the borough funds.

Private vehicles for hire exempt from provisions of by-laws.

29. No vehicle which shall be let for hire by special agreement only, or when bespoken at the stables or residence of its owner, and which shall never publicly take its place on any stand, or ply for hire off the premises of its owners, shall be deemed a licensed vehicle within the meaning of this part of these by-laws, nor shall the owner, driver, or conductor of such vehicle be subject to the provisions thereof in any respect whatsoever.

Interpretation of the word "Vehicle."

30. Whenever the word vehicle shall be used in this part of these by-laws, the same shall be understood to apply to either an omnibus, omnibus car, hackney carriage, or cab, and an omnibus shall be meant to be a vehicle upon four wheels, drawn by two or more horses; an omnibus car, a vehicle upon four wheels, drawn by one horse; and a car, a vehicle upon four wheels, drawn by two or more horses; and a cab, a vehicle upon two wheels, for which a "hackney carriage" license has been taken out.

No vehicle to be withdrawn without the permission of the Mayor.

31. No proprietor of any hackney carriage or omnibus shall withdraw the same from hire, without leave from the Mayor or the By-law Committee, so to do; provided that proprietor may withdraw his vehicle on giving six days' notice of his intention so to do to the Council Clerk.

SCHEDULE A.

A requisition for license to

To the Municipal Council of the borough of Narrandera.

I, , residing in street, do hereby request that a license may be granted to me No. , within the said borough.

Dated 18 .

SCHEDULE B.

License.

THIS is to certify that is hereby licensed to a certain No. , within the borough of Narrandera, from the date hereof to the 30th day of June next, subject nevertheless to all and every the by-laws, rules, and regulations in force relating thereto.

Given under the Common Seal of the Municipal Council of the borough of Narrandera, this day of 18 .

Mayor.

Council Clerk.

PART IX.

Carters.

License for carts.

1. The Council shall, from time to time, license to ply for hire within the borough such carts as respectively after inspection by the By-laws Committee shall be found fit for public use, and also such carts to be used within the said borough in hawking wood or water for sale respectively, or both wood and water, and also such carts to be used and ply for hire, or to be employed as night-carts within the said borough, as shall after the like inspection be found fit for such purposes respectively, and for every such license, there shall be paid to the Council such sum as with respect to each kind of cart aforesaid is set out in Schedule A hereto.

Applications for licenses.

2. Every such license shall be granted on the written application for the same, of the owner, or if there be more owners than one of some, one owner of the cart to be licensed, and in every such application shall be set forth truly the name and surname, and place of abode of the applicant, and the like shall be set forth in the license when granted, which would be in the form of Schedule B hereto, or to the like effect; and any person who shall wilfully omit from any such application any particulars hereby required to be stated therein, or who shall wilfully state anything falsely touching any such particular shall forfeit a sum not exceeding £10.

Numbering, &c., of licenses and carts.

3. Every such license shall be numbered and registered by the Town Clerk, and shall be in force for one year only from the date thereof, or until the 31st day of December next ensuing, and the owner named in any such license shall cause to be painted or marked, and to be kept so painted or marked on some conspicuous part on the right or off side of the cart thereby licensed, the name of the borough with the number of such license in legible letters and figures, 1 inch in length, and of a proportionate breadth, and the words "licensed cart," in the like letters, and every such owner who shall omit or fail to comply with the provisions of this section, shall forfeit and pay a sum not exceeding £2.

License for cart may be extended to hawking of wood and water.

4. The Town Clerk shall, from time to time, upon application by the owner named in any license for any such cart (not being a night-cart), made and sign with his name, without fee or reward, an endorsement on such license being still in force authorizing during the currency of such license, or for such less time as may be stated in such endorsement, the use of such cart for the hawking for sale within the borough of wood or of water or of both wood and water, and forthwith upon making such endorsement, shall make an entry thereof in the registry against the entry of such license, and every authority so endorsed upon any such license, shall, while the same shall be in force, have the effect of, and be deemed for, all purposes to be a license of the like tenor.

Plying for hire, &c., without license, &c.

5. If any owner of any cart permit the same to stand or ply for hire, or to be used as a wood-cart, or as a water-cart, or to ply for hire, or to be used as a night-cart within the borough without having a license in force for such cart, licensing or authorizing such standing, plying for hire or use respectively within such borough, or if any person be found within such borough standing or plying for hire with any cart, or using any wood-cart or water-cart, for plying for hire with, or using any night-cart for which respectively no license is in force, or without having the name of the borough and the number of such license, and the words "licensed cart," displayed upon such cart openly and in manner herein provided, every such person so offending shall forfeit a sum not exceeding £2.

Driver to hold and produce license.

6. The driver of every licensed cart shall hold the license for such cart, and shall when required by the Inspector of Licensed Vehicles or by any person wishing to hire or having hired such cart, if licensed to stand and ply for hire, produce for the inspection of the person so requiring such license, and also a copy of the table of rates and charges appointed by Schedule C hereto (which copy shall be furnished free of charge to such driver by the Town Clerk), and every such driver who shall on being so required refuse or neglect so to produce such license or copy, shall forfeit a sum not exceeding £2.

Owner to cause driver's name to be written on license.

7. Every owner of a cart licensed as aforesaid who shall employ any other person to drive the same shall cause to be truly written on the license for such cart, the name of the person so employed, and shall keep such name so written while such person remains so employed, and thereafter forthwith shall erase or deface such writing; and if any such owner shall wilfully make default in causing such writing to be made or to be erased or defaced respectively when and as herein required, or if any person so employed as aforesaid, shall without reasonable excuse neglect or refuse when required by such owner to produce or return to such owner such license, every person so offending shall forfeit a sum not exceeding £2.

Omission to carry when required—exacting excessive fares—plying elsewhere than on stand.

8. Every owner or driver of any cart licensed to stand or ply for hire, which shall stand upon any standing appointed for the purpose by resolution of the Council published as required by the by-laws of the borough, who, when required by any person, who after sunrise and before sunset any day wishes to hire or has hired such cart, refuses or neglects without reasonable excuse to carry for a single load such weight as shall have been appointed as provided by a like resolution or any less weight to any place within the borough, and every such driver or owner who demands and takes for the hire of such cart a greater sum than that appointed as aforesaid, or who without reasonable excuse neglects or refuses to load or unload such cart when hired so far as he can without assistance, or who shall stand or ply for hire with such cart elsewhere than at some standing or place appointed by a like resolution, shall, for every such offence, forfeit and pay a sum not exceeding £2.

Abusive language by driver.

9. Every owner or driver of any cart who shall use any abusive or insulting language to any person who wishes to hire or has hired such cart, or if the same be then employed as a wood-cart or water-cart, who shall deal with such owner or driver for the purchase of or have immediately before purchased of him, any wood or water of the loading of such cart respectively, shall forfeit a sum not exceeding £2.

Leaving carts unattended.

10. If the driver of any cart shall leave the same unattended in any street, whether public or private, or shall go for a distance of more than 2 yards from the side of such cart being in any such street without passing through the near wheel or wheels thereof a suitable chain or chains, so as effectually to prevent the rotation of such wheel or wheels, whether in any case such cart be hired or not, such driver shall, in every case, forfeit a sum not exceeding £2.

Feeding horses in street—muzzles.

11. No driver of any cart in any street, whether public or private, or in any other public place shall feed any horse attached to such cart, save by means and out of a nosebag containing the forage, and attached to the head of such horse, or shall remove the winkers of any such horse; and every driver of any cart to which any vicious horse shall be attached shall keep such horse while standing on any stand, or in any such street or place as aforesaid properly muzzled; and every driver offending against this section, shall forfeit a sum not exceeding £2.

Wood or water cart standing at improper places.

12. Every owner or driver of any licensed wood-cart or water-cart for the time being employed as such respectively, who shall stand with such cart, save for such reasonable time as may be necessary for loading or unloading the same, elsewhere than at some standing appointed by resolution of the Council published as aforesaid, for wood-carts or water-carts (as the case may be), shall forfeit a sum not exceeding £2.

Water cart to have name of premises marked.

13. Every owner of a licensed water-cart shall cause his name and the words "licensed water-cart" to be painted or marked and kept painted or marked in legible letters 1 inch in length and of proportionate breadth, in white on black ground in a conspicuous place outside the premises where such cart is kept, and if any such owner shall fail to comply with the provisions of this section he shall forfeit a sum not exceeding £2.

Suspension or revocation of license.

14. The By-law Committee may at any time, if it shall be proved to their satisfaction that the owner of the cart thereby licensed has been convicted of two offences against this part of these by-laws or of any offence in respect of any property entrusted to him as such owner suspend for any stated time or revoke as seems to them fit such license, and no license while suspended under this section or otherwise shall be deemed to be of any force or virtue hereunder.

Lights for carts.

15. The driver of every cart, buggy, and every other vehicle which shall during the hours after sunset of any day, and before sunrise of the following day, be in any public place or street within the said borough, shall keep a light attached to or suspended from the off or right side of such cart so as to be plainly visible to the driver of any carriage proceeding along or through such place or street in a contrary direction to that in which such first-mentioned cart shall be directed, and in the case of a night-cart only such light shall be such and be so disposed as to appear white in front and red at the outer side, and every driver who shall fail to comply with this section shall forfeit a sum not exceeding £2.

Interpretation.

16. The word "cart" shall for the purpose of this part of these by-laws include every waggon, dray, or other such carriage whatever be its construction, drawn by horses or other animals, used wholly or chiefly for the carriage of burthens or heavy goods; the word "wood-cart" shall mean a cart used in hawking firewood for sale; the word "water-cart" shall mean a cart used in hawking of water for sale; and the word "night-cart" shall mean a cart used in the carrying or removing of night-soil, offal, or other offensive refuse.

SCHEDULE A.

Table of charges for carters' licenses.

The license fee for all carters shall be at the rate of 10s. per wheel per annum, and all such licenses shall be issued for a period of twelve months, terminable on the 30th day of June in each year.

SCHEDULE B.

Form of license.

This is to certify that a certain cart, No. of which of is the owner, hereby licensed to ply for hire as a within the borough of Narrandera from the date hereof to the 31st day of December next; subject, nevertheless, to all the by-laws, rules, and regulations in force relating thereto.

(L.S.)

Council Clerk. Mayor.

SCHEDULE C.

For all vehicles used for carrying passengers.

For each adult passenger, 6d.; for children under twelve years, 3d.

For vehicles with four wheels drawn by one horse, 2s. per hour or fractional part of an hour.

For vehicles with four wheels, drawn by two or more horses, 3s. per hour or fractional part of an hour.

Carts with two wheels with one or more horses, 2s. per hour or fractional part of an hour.

Waggon, van, or lorry, four wheels, drawn by two or more horses, 3s. per hour or fractional part of an hour.

I hereby certify that the by-laws on this and the preceding ninety-five sheets are by-laws passed by a resolution of the Council of the borough of Narrandera, on Wednesday, the 15th day of July, A.D. 1885.

(L.S.) R. H. FERRIER,

Mayor.

PERCY HIGGINS,

Council Clerk.

Sydney: Thomas Richards, Government Printer.—1886.

[1s. 3d.]

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF WOOLLAHRA—AMENDED BY-LAW.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 21st January, 1886.

BOROUGH OF WOOLLAHRA—AMENDED BY-LAW.

THE following amended By-law, made by the Council of the Borough of Woollahra, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the "Municipalities Act of 1867."

JOHN ROBERTSON.

THE FOLLOWING BY-LAW WAS AGREED TO BY THE BOROUGH COUNCIL OF WOOLLAHRA, ON THE 19TH DAY OF OCTOBER, 1885.

THAT on and after the date of this By-law coming into operation, the undermentioned shall be the dues chargeable on goods landed at or shipped from the Double Bay, Darling Point, and Rose Bay Jetties and for any other jetties now or hereafter under the control of this Council, in substitution of Schedule B, By-law 134 of the General By-laws of this Borough, dated 23rd September, 1879, and published in the Government Gazette of the 12th January, 1880, No. 11:—

	s.	d.
Slates, per 1,000	1	6
Bricks and tiles, per 1,000	2	0
Sawn timber and timber in logs, per 1,000	1	6
Laths and shingles, per 1,000	0	3
Hay, per ton	1	6
Coal, per ton	0	6
Firewood, per ton	0	6
Fruit, potatoes, or other vegetables, per bushel or less quantity	0	1
Lime, charcoal, or ashes, per bushel or less quantity	0	1
Posts and rails, per 100	1	0
Palings, per 100	0	3
Blue metal, ballast, stone, sand, or earth, per ton	0	6
All unmentioned articles, per ton	1	0

(L.S.) ROBERT BUTCHER,
Mayor.

C. A. VIVIAN,
Council Clerk.

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

MUNICIPAL DISTRICT OF NORTH ILLAWARRA—AMENDED BY-LAW.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 18th January, 1886.

NORTH ILLAWARRA MUNICIPAL DISTRICT.—AMENDED BY-LAW.

THE following amended By-law, made by the Council of the Municipal District of North Illawarra, relating to the time for the holding of Meetings of the Council, having been confirmed by His Excellency the Governor with the advice of the Executive Council, is published in accordance with the requirements of the "Municipalities Act of 1867."

JOHN ROBERTSON.

NORTH ILLAWARRA MUNICIPAL DISTRICT.

BY-LAW made and passed by the Council of the Municipal District of North Illawarra, for altering the time for the holding of meetings of the Council.

THE existing By-law published in a Supplement to the Government Gazette of date 1st November, 1883, is hereby repealed and the following By-law substituted in lieu thereof, viz.:—

The Council shall meet for the despatch of business on the first Tuesday in every month, at seven o'clock p.m., unless such day shall happen to be a Public Holiday, in the latter case the meeting shall be held on such other day as the Mayor may appoint.

Passed by the Municipal District Council of North Illawarra, this third day of November, in the year of our Lord one thousand eight hundred and eighty-five.

(L.S.) WILLIAM K. BATE,
Mayor.

HENRY STUMBLES,
Council Clerk.

1885-6.

NEW SOUTH WALES.

MUNICIPALITIES.

(MUNICIPAL DISTRICT OF NORTH ILLAWARRA—AMENDED BY-LAW.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 2nd June, 1886.

NORTH ILLAWARRA MUNICIPAL DISTRICT.—AMENDED BY-LAW.

THE following Amended By-law, made by the Council of the Municipal District of North Illawarra, relating to Meetings of the Council, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of "The Municipalities Act of 1867."

GEORGE R. DIBBS.

NORTH ILLAWARRA MUNICIPAL DISTRICT.

BY-LAW made and passed by the Council of the Municipal District of North Illawarra, for altering the day and time for the holding of Meetings of the Council.

The existing By-law, published in a Supplement to the Government Gazette of date 18th January, 1886, is hereby repealed, and the following By-law substituted in lieu thereof, viz.:—"The Council shall meet for the despatch of business on the first Wednesday in every month at 3 o'clock p.m., unless such day shall happen to be a public holiday; in the latter case, the meeting shall be held on such other day as the Mayor may appoint.

Passed by the Municipal District Council of North Illawarra, this twentieth day of April, in the year of our Lord one thousand eight hundred and eighty-six.

(L.S.) P. LAHIFF,
Mayor.

HENRY STUMBLES,
Council Clerk.

1885-6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF BATHURST—BY-LAW.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 22nd February, 1886.

BOROUGH OF BATHURST.—BY-LAW.

THE following By-law, made by the Council of the Borough of Bathurst, relating to loitering on the streets of the Municipality, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the "Municipalities Act of 1867."

JOHN ROBERTSON.

ANY person or persons remaining or loitering in or obstructing any road, street, or footway, or other public place within the Municipality, to the inconvenience of the passers-by, or in any way interrupting the traffic, shall discontinue to do so on being required by any officer of the Municipal Council, or any Magistrate, or any Police Officer, and failing to comply with such request shall be liable to a penalty of not less than ten shillings nor more than ten pounds, and for any subsequent conviction shall be liable to a penalty of not less than two pounds nor more than twenty pounds.

Passed at a meeting of the Bathurst Borough Council, held on Wednesday, the ninth day of December, one thousand eight hundred and eighty-five.

(L.S.) E. T. WEBB,
Mayor.

DAVID C. WILLIAMSON,
Council Clerk.
11th December, 1885.

1885-6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF ALEXANDRIA—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 138.

Colonial Secretary's Office,
Sydney, 25th February, 1886.

BOROUGH OF ALEXANDRIA.—BY-LAWS.

THE following By-laws, made by the Council of the Borough of Alexandria, for the regulation of Places of Amusement within the Municipality, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the "Municipalities Act of 1867."

JOHN ROBERTSON.

BOROUGH OF ALEXANDRIA.—BY-LAWS.

Amusements.—Unlawful games.

1. No games with dice, or other games of chance for money, prize-fighting, cock-fighting, dog-fighting, or other entertainment opposed to public morality, or involving cruelty to animals, or likely to cause a breach of the peace, shall be established, held, or given within the Borough; and any person or persons who shall establish, hold, give, or cause to be established, held, or given, any such game, exhibition, or entertainment, shall, for every such offence, forfeit and pay a sum not exceeding ten pounds nor less than five pounds.

Places of amusement to be licensed.

2. No dancing saloon, bowling or skittle alley, shooting gallery, or similar place of amusement (other than entertainments requiring to be licensed by law) shall exist or be established within the Borough, unless and until such place of amusement shall have been licensed by the Council as hereinafter provided; and in the event of any such licensed place of amusement being improperly conducted or becoming a nuisance or an annoyance to any inhabitant, or violating public decency, or endangering the public peace, the Mayor shall, on representation to that effect being made, forthwith suspend the said license, and the Council at its next meeting shall, by resolution, cause the said license to be cancelled or otherwise, as may appear necessary or desirable; and any person or persons having already established such places of amusement as aforesaid, who shall not, within thirty days after these By-laws come into operation, apply for such license, or any person or persons who shall open, establish, or maintain any such place of amusement as aforesaid, without having obtained such license, shall forfeit and pay a sum not exceeding thirty pounds nor less than ten pounds for every such offence.

Mode of granting licenses

3. Applications for licenses as aforesaid must be in writing, addressed to the Mayor and Aldermen, and must be endorsed by two householders, testifying to the respectability of the applicant. The application must describe clearly the nature of the entertainment for which the license is sought and the premises in which it is to be held.

License fees.

4. Licenses shall be granted by resolution of the Council, upon payment of license fees, as follows:—For every license granted between the first day of January and the thirty-first day of December, one pound one shilling (£1 1s.) All licenses shall expire on the thirty-first day of December in each year, and may be renewed by resolution of the Council, upon written application fourteen days previous to the expiry of such license, and on payment of the annual fee of one pound one shilling (£1 1s.)

(L.S.) C. JESSON, Mayor.

KELSON VAUGHAN,
Council Clerk.

Town Hall, Garden-street,
29th December, 1885.

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF PADDINGTON—ADDITIONAL BY-LAW.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 7th April, 1886.

BOROUGH OF PADDINGTON.—ADDITIONAL BY-LAW.

THE following additional By-law, made by the Council of the Borough of Paddington, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the "Municipalities Act of 1867."

GEORGE R. DIBBS.

ADDITIONAL BY-LAW REFERRED TO.

ALL persons standing or loitering upon any of the footways or other public places in the Borough of Paddington, to the inconvenience of the passers-by, or in any way interrupting the traffic, and shall not discontinue to do so on being requested by any officer of the Municipal Council of Paddington, or any Police Officer, shall upon conviction forfeit and pay a penalty not exceeding five pounds and not less than five shillings.

Passed by the Municipal Council of the Borough of Paddington, on Tuesday, the sixteenth day of February, A.D. 1886.

(L.S.) CHARLES HELLMRICH,
Mayor.

GEORGE E. BLACKMORE,
Council Clerk.

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF WAVERLEY—BY-LAW.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 27th March, 1886.

BOROUGH OF WAVERLEY.—BY-LAW.

THE following By-law, made by the Council of the Borough of Waverley, under the "Municipalities Act of 1867," having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the above-cited Act.

GEORGE R. DIBBS.

ANY person or persons loitering in or obstructing any street, lane, or pathway in the Borough of Waverley, by standing or congregating thereon, and refusing to move or disperse when requested so to do by any member of the Police Force or an authorized officer of the Council, shall be liable to a penalty not exceeding two pounds (£2).

By virtue of the powers and authority of the "Municipalities Act of 1867" the Council of the Borough of Waverley passed the foregoing By-law on the twelfth day of January, 1886.

(L.S.) W. H. SIMPSON,
Mayor

ROBERT T. ORR, Council Clerk.

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF WAVERLEY—AMENDED BY-LAW.)

Presented to Parliament, pursuant to Act 39 Vic. No. 14, sec. 18.

Colonial Secretary's Office,
Sydney, 13th May, 1886.

BOROUGH OF WAVERLEY.—AMENDED BY-LAW.

THE following amended By-law, made by the Council of the Borough of Waverley, relating to the Meetings of the Council, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the "Municipalities Act of 1867."

GEORGE R. DIBBS.

That the following By-law be substituted for By-law No. 1 of 28th September, 1868,—

Ordinary Meetings of the Council.

UNLESS otherwise ordered, the Council shall meet on the first and third Tuesday in each month at the hour of seven p.m., from the first May to thirty-first August, and from first September to (30th) thirtieth April, at the hour of 7·30 p.m., provided that if such day happen to be a Public Holiday, the Meeting shall be held on such other day as the Mayor may appoint.

By virtue of the powers and authority of the Municipalities Act of 1867, the Council of the Borough of Waverley passed the foregoing By-law on the 16th day of March, 1886.

(L.S.) WM. MARTIN,
Mayor.

ROBERT T. OBR, Council Clerk.

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF VICTORIA—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 14th April, 1886.

BOROUGH OF VICTORIA.—BY-LAWS.

THE following amended By-laws, made by the Council of the Borough of Victoria, for the regulation, control, and management of the Wharf at the foot of Walker-street, Lavender Bay, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the "Municipalities Act of 1867."

GEORGE R. DIBBS.

BOROUGH OF VICTORIA.

BY-LAW the better to enable the Municipal Council of the Borough of Victoria to regulate, control, and manage the Wharf at the foot of Walker-street, Lavender Bay, to repeal and amend existing By-law in relation to the same, and to provide for the leasing of a portion of the said Wharf. It is hereby ordered by the Municipal Council of the Borough of Victoria :—

Repeal of existing By-law.

1. The By-law made and passed by the Council on the 5th day of September, 1877, and published in a Supplement to the Government Gazette, No. 318, bearing date 11th October, 1878, is hereby repealed.

Division of Wharf.

2. The Wharf shall be divided into two lots. Lot No. 1 shall consist of 12 feet frontage to the bay, and lot No. 2 shall consist of the remainder of the frontage to the bay, lot No. 1 commencing at the eastern side of the Wharf.

Uses of the respective Lots.

3. Lot No. 1 shall be reserved and appropriated for the purpose of loading and unloading merchandise, and for the landing or taking off passengers by boatmen conveying passengers for hire, or by passengers in their own boats; and lot No. 2 shall be reserved and appropriated for the purpose of landing or taking off passengers by steam ferry boats.

Leasing Portion.

4. The Council may lease lot No. 2 for a period of one or more years, open to public competition, and upon conditions hereunto appended.

Vessels not to make fast to Wharf, &c.

5. No ship, steamboat, or other vessel shall be allowed to make fast to or remain alongside the Wharf except while actually loading or unloading cargo, or landing or taking off passengers; and no owner or master of any such ship, steamboat, or other vessel shall suffer or allow any such vessel to remain alongside the Wharf longer than may be necessary to load or unload cargo, or to land or take off passengers.

Goods not to be left on Wharf.

6. No goods, merchandise, produce, or butcher's meat for shipment shall be allowed on the Wharf until a vessel is ready to receive the same, and all goods, merchandise, produce, or butcher's meat landed from any vessel shall be so placed as not to interfere with the general use of the Wharf, and shall in all cases be immediately removed therefrom by the owner, or in default by the Council, and all expenses attending such removal by the said Council, shall become a charge upon the goods so removed.

Penalties.

7. Every person who shall commit any breach of or offend against any section or part of this By-law shall, for every such breach or offence, forfeit and pay any sum not exceeding five pounds, to be recovered by summary jurisdiction before any two Justices of the Peace.

APPENDIX.

CONDITIONS for leasing a portion of the Wharf at foot of Walker-street, Lavender Bay.

GENERAL CONDITIONS.

1. The lot proposed to be leased shall be advertised for tender or for sale by public auction in the "Sydney Morning Herald," the local journals, and by a notice posted in a conspicuous place on the Wharf.

2. The highest tenderer or bidder at public auction shall be the lessee provided he himself and the securities offered are approved of by the Council.

3. The lessee or lessees and his or their sureties, of whom there shall be two, shall enter into a bond for a sum equal to double the amount of one year's rent, as a security for the regular payment of the rent, and for the due observance of all the conditions herein contained.

4. The rent to be paid quarterly in advance to the Council Clerk.

5. The Council reserves to itself the right of resuming any portions of the lot for any alterations or repairs that may be found necessary, allowing a proportionate amount in the rent during the time occupied in such repairs or alterations in the same ratio as the part resumed bears to the whole.

6. The lessee to keep the lot in good repair during tenancy reasonable wear and tear only excepted.

7. The lessee shall not assign or sublet except with the consent in writing of the Council.

8. The lessees will not be allowed to erect any buildings except with the consent in writing of the Council.

SPECIAL CONDITIONS.

1. The Lessees to run a steamboat to and from Lavender Bay and Sydney daily throughout the year, leaving Lavender Bay at 5·30 a.m. from September 30th to March 31st, and at 6 a.m. from April 1st to September 30th, and continue running every twenty minutes until 11·45 p.m. from Lavender Bay, last boat to leave Sydney at midnight. Sundays, first boat from Lavender Bay at 8 a.m., and last boat from Sydney at 10·30 p.m. Fares not to exceed two pence for each adult passenger.

2. In the event of the lessees or any of their servants being found guilty of any gross misconduct, the Council may cancel the lease at any time without further notice than proof of alleged misconduct, to be determined by any two Justices in Court of Petty Sessions.

Made and passed by the Municipal Council of the Borough of Victoria, this first day of February, 1886.

(L.S.) M. M'MAHON,
Mayor.

WALTER G. WILLINGTON,
Council Clerk.

Sydney: Thomas Richards, Government Printer.—1886.

[3*d*.]

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF NORTH WILLOUGHBY—AMENDED BY-LAW.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 2nd June, 1886.

BOROUGH OF NORTH WILLOUGHBY.—AMENDED BY-LAW.

THE following Amended By-law, made by the Council of the Borough of North Willoughby, relating to Meetings of the Council, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published, in accordance with the requirements of "The Municipalities Act of 1867."

GEORGE R. DIBBS.

BOROUGH OF NORTH WILLOUGHBY BY-LAW.—AMENDED BY-LAW WITH REFERENCE TO MEETINGS OF THE COUNCIL.

That clause 7 of the By-laws of 16th October, 1871, be amended so as to read "That the Meetings of the Council be held at the hour of 7·30 p.m. on the first and third Monday of each month."

Passed by the Borough Council of North Willoughby, on the 6th day of March, 1886.

(L.S.) HOWARD FLEMING,
Mayor.

JAMES ANDERSON,
Council Clerk.

[3d.] 561—

1885-6.

NEW SOUTH WALES.

MUNICIPALITIES.

(MUNICIPAL DISTRICT OF NOWRA—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 14th June, 1886.

MUNICIPAL DISTRICT OF NOWRA.—BY-LAWS.

THE following By-laws, made by the Council of the Municipal District of Nowra, under the "Municipalities Act of 1867," having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the above-cited Act.

GEORGE R. DIBBS.

BY-LAWS to regulate the erection of Balconies, Awnings, &c., on and over the roads and footways of the Municipality within the town of Nowra.

1. That application for the erection of a balcony, awning, posts for bearing lamps, or for any other purpose, on the roads or on and over the footways of the Municipality within the town of Nowra, must be made to the Council; that if the Council is satisfied that the public traffic will suffer no inconvenience thereby, such applications will be allowed subject to the approval of the Council; that the specifications for such erections accompanying same are safe and substantial, and that the applicant indemnifies the Council against any or all accidents occurring therefrom. And in respect to balconies, that they be open from end to end, and not used for any other purpose except an open promenade. Any infraction of this By-law relating to balconies shall subject the occupier of said premises to a penalty not exceeding ten pounds and not less than one pound for every day or portion of a day any part of the said balcony is enclosed or used contrary to this By-law.

2. Any person acting contrary to the said By-laws by erecting posts for awnings, or any other purpose, on the roads or footways of the Municipality within the town of Nowra, without authority from the Council, shall be liable to a penalty not exceeding ten pounds and not less than one pound, together with the expenses of removing said obstruction; and in the case of erecting a balcony without authority from the Council, the parties so offending to be liable to a penalty not exceeding twenty pounds and not less than two pounds, and to a penalty of one pound per day for every day such balcony or portion of a balcony is not removed after due notice from the Mayor to remove the same within three days.

3. That the Council is fully authorized at any time to remove all awnings or other erections on the footways or roadways of the Municipality within the town of Nowra they may consider desirable, whether such awnings are now or hereafter erected, provided they consider the removal of same is desirable for the safety and convenience of the public traffic.

By virtue of the powers and authority of the "Municipalities Act of 1867," the Council of the Municipal District of Nowra passed the foregoing By-laws on the twenty-eighth (28th) day of July, 1885.

THOMAS EDWARDS, Council Clerk. (L.S.) HENRY MOSS, Mayor.

BY-LAWS to regulate Crossings over Public Water-tables and Footways.

1. That all crossings within the town of Nowra be constructed of stone or earthenware pipes.

2. That application for said crossings be made to the Council stating full particulars of site and proposed construction, and that such work be not commenced until the said application is approved of and a certificate to that effect signed by the Mayor.

3. That if said crossings are not made or erected in accordance with the application, the Mayor has full authority to remove the same as an obstruction, at the expense of the owner or applicant requiring same, such owner or party erecting such obstruction to be liable to a penalty not exceeding five pounds and not less than five shillings, besides the cost of removal of said obstruction: Provided that on the offending party being served with a written notice, signed by the Mayor, to remove said obstruction, that the said party removes the same within three days and repairs all damage sustained in connection therewith, then the above penalty to be null and void. Should the said crossing at any time prevent the flow of water along the proper water-table, the owner of the premises having the benefit of said crossing to repair the same without delay on receiving notice from the Council or authorized appointed officer; and, failing to do so, the Mayor is hereby empowered and authorized to repair the same at the expense of the said owner.

4. Any person interrupting the Council or duly appointed officer and workmen in repairing and replacing any crossing or any other Municipal work within the Nowra Municipality to be liable to a penalty not exceeding twenty pounds and not less than one pound, together with costs of Court.

By virtue of the powers and authority of the "Municipalities Act of 1867," the Council of the Municipal District of Nowra passed the foregoing By-laws on the 2nd day of July, 1885.

(L.S.) HENRY MOSS, Mayor.
THOMAS EDWARDS, Council Clerk.

USING Bark for Building in the Main Streets of the Town of Nowra.

No person shall erect any building of bark, nor roofed with that material or with calico, within the populous parts of the town, except by express permission of the Council, and then for a temporary purpose only. Any person so offending shall on conviction, be liable to a penalty not exceeding ten pounds nor less than one pound, and shall be bound to remove the aforesaid building within such period as the Council may determine.

By virtue of the powers and authority of the "Municipalities Act of 1867," the Council of the Municipal District of Nowra passed the foregoing By-law on the 28th day of July, 1885.

(L.S.) HENRY MOSS,
Mayor.

THOMAS EDWARDS,
Council Clerk.

DRAINS in Footpaths in the Town of Nowra.

No surface drain shall be made in any footpath, and no pipe or drain to be laid under or across the same within the town of Nowra without the authority of the Council; and no such pipe or drain shall be used for the discharge into any street or roadway of any offensive liquid or matter of any kind whatsoever; and any person who shall offend against this By-law shall forfeit and pay any sum not exceeding fifty pounds nor less than one pound.

By virtue of the powers and authority of the "Municipalities Act of 1867," the Council of the Municipal District of Nowra passed the foregoing By-law on the twenty-eighth day of July, 1885.

(L.S.) HY. MOSS,
Mayor.

THOMAS EDWARDS,
Council Clerk.

Sydney: Thomas Richards, Government Printer.—1886.

[3d.]

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

MUNICIPAL DISTRICT OF NOWRA—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 18th August, 1886.

MUNICIPAL DISTRICT OF NOWRA.—BY-LAWS.

THE following By-laws, made by the Council of the Municipal District of Nowra, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the "Municipalities Act of 1867."

GEORGE R. DIBBS.

BY-LAWS.

WILFUL TRESPASS.

EVERY person who shall wilfully let in or knowingly suffer to enter upon the Public Common or Recreation Ground under the control of the Council any animals without due authority, shall be deemed guilty of wilful trespass, and shall be liable, for every such offence, to a penalty not exceeding ten pounds, nor less than two pounds.

TO REGULATE THE NOWRA COMMON AND RECREATION.

ALL persons found guilty of the undermentioned offences, to be liable to a penalty for each offence not exceeding ten pounds, and not less than five shillings, together with the amount of damage incurred :—

Removing timber, stone, gravel, or any other material.
Trespassing on said Common with firearms; and felling, or attempting to fell, any trees thereon.
Wilfully breaking and opening, or attempting to open, and injure or injuring the boundary fence of the said Common, or any of the gates attached thereto.
Driving, or placing bulls and stallions on said Common for agistment, without reporting same to person in charge,

All charges for agistment of stock on said Common be fixed from time to time by resolution of Council, and that a monthly return of same be made by the person in charge to the Council, under a penalty not exceeding five pounds, and not less than ten shillings, such monthly returns, on being exhibited to the first ensuing Meeting of Council, to be signed by the Mayor and copied by the Council Clerk as a public record of the receipts from the said Common, for the information of all interested.

By virtue of the powers and authority of the "Municipalities Act of 1867," the Council of the Municipal District of Nowra passed the foregoing By-laws on the 28th day of July, 1885.

(L.S.) HENRY MOSS,
Mayor.

T. EDWARDS,
Council Clerk.

1885-6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF WEST MAITLAND—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 153.

Colonial Secretary's Office,
Sydney, 15th July, 1886.

BOROUGH OF WEST MAITLAND—BY-LAWS.

THE following By-laws made by the Council of the Borough of West Maitland, for regulating and licensing omnibuses, waggonettes, cars, and hackney carriages, and hansom cabs and buggies respectively, plying for hire within the Borough, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the "Municipalities Act of 1867."

GEORGE R. DIBBS.

BOROUGH OF WEST MAITLAND.

BY-LAWS for regulating and licensing omnibuses, waggonettes, cars, and hackney carriages, plying for hire within the Borough of West Maitland.

THE Council of the Borough of West Maitland do, by virtue of the power and authority vested in such Council by the Municipalities Act of 1867, hereby make the following By-laws for regulating and licensing omnibuses, waggonettes, cars, and hackney carriages, plying for hire within the said Borough of West Maitland, and declare that the same shall stand in the place of and instead of all By-laws heretofore in force relating thereto, which By-laws heretofore made are hereby repealed.

1. In the construction of these By-laws unless the context shall otherwise indicate, the following terms in inverted commas shall bear the meaning and include the things hereinafter severally assigned or set against them.

"Council."—The Borough Council of West Maitland.

"Inspector."—The Inspector or Sub-inspector of Vehicles, now or hereafter to be appointed by the said Borough Council.

"Proprietor."—Every person who alone or in partnership with any other person, shall keep any vehicle for which a license shall or may be obtained by or transferred to him under these By-laws.

"Driver."—Every person engaged or employed in driving any licensed vehicle.

"Conductor."—Every person other than the driver engaged or employed in attending upon passengers in or upon any omnibus, waggonette, car, or hackney carriage.

"Passenger."—Every person carried in or upon any vehicle other than the driver or conductor.

"Horse."—Horse, mare, gelding.

The word "vehicle" in these By-laws shall include and apply to every omnibus, waggonette, car, or hackney carriage. An omnibus shall mean a vehicle upon four wheels drawn by one or more horses, a waggonette shall mean a vehicle upon four wheels, drawn by one or more horses, and a car shall mean a vehicle upon two wheels, for which omnibus licenses have been taken out, and a hackney carriage shall mean a vehicle upon four wheels drawn by two or more horses, plying for hire within the Borough of West Maitland, and in the construction of these By-laws any word importing the singular number shall be understood to include several persons or things as well as one person or thing, and any word importing the plural number, shall be applied to one person or thing, and every word importing the masculine gender shall extend and be applied to a female as well as a male.

2. No person shall ply a vehicle for hire nor shall any person act as driver or conductor of any such vehicle within the said Borough of West Maitland, until and unless licensed for such purpose in the manner hereinafter mentioned, nor during the suspension or after cancellation of such license as hereinafter provided.

3. Before any license for plying any such vehicle, or for driving or conducting the same shall be granted the party requiring such license shall obtain from the Council Clerk free of charge, a requisition in the form of Schedule A hereto, or to the like effect, and shall duly fill up and sign the same and deliver it to the Council Clerk. And in the case of drivers and conductors shall obtain a certificate from two respectable ratepayers to the effect that the applicant is of good character, and competent to act as such driver or conductor as the case may be, and shall also obtain from the Inspector a certificate that the vehicle for which a license is applied for is fit for the accommodation and conveyance of passengers, and that the applicant is of good character, and competent to act as such driver or conductor as the case may be.

4. The Mayor of the said Borough for the time being shall be and is hereby authorized to issue all such licenses in the name and on behalf of the said Borough Council. Provided that if such certificate as aforesaid be refused by the Inspector, the matter shall be referred to and decided by the Council upon such evidence as may be adduced before them by the parties interested therein.

5. Licenses for proprietors, drivers, or conductors of vehicle, shall be in the form of Schedule B hereto or to the like effect, and shall be made out, numbered, and registered by the Council Clerk.

6 Every license granted by the Mayor shall bear the impression of the Seal of the said Borough Council, and shall be signed by the Mayor and countersigned by the Council Clerk, and shall be in force until the thirty-first day of December next ensuing the date thereof unless cancelled, and no such license shall include more than one vehicle, and shall state the number of passengers such vehicle shall be permitted to carry.

7. For every vehicle license and for every renewal thereof there shall be paid to the said Borough Council the sum of two pounds annually if the license be granted on or after the first day of January, and on or before the thirty-first day of March in every year; and if after that date then the following proportions:—If on or before the thirtieth day of June, the sum of thirty (30) shillings, if on or before the thirtieth day of September, the sum of twenty (20) shillings, and if after that date the sum of ten (10) shillings.

8. For every conductor's or driver's license and for every renewal thereof there shall be paid to the said Borough Council the sum of five shillings.

9. The person or persons in whose name or names a vehicle license shall have been obtained shall be deemed the proprietor of the vehicle in respect of which such license shall have been taken out.

10. No license shall be granted to any person to drive any vehicle unless he be above seventeen years of age, nor to act as conductor unless he be fourteen years of age.

11. Every driver or conductor licensed under these By-laws shall whilst driving or conducting any vehicle wear a badge on the left breast outside his clothing, such badge to be furnished free of charge at the time of the issue of the license, and the said driver or conductor shall keep the same clean and in good order.

12. No proprietor shall be at liberty to part with or lend his license, and any proprietor transferring or selling his licensed vehicle shall immediately give notice thereof to the Council Clerk, and the transferree or purchaser shall thereupon apply to have the license transferred to him, and shall sign his name in the books of the said Borough Council and on the license, and until this By-law shall have been complied with the transferror or seller shall remain liable as owner for breach of any of these By-laws, and no transferree or purchaser shall use such vehicle or allow it to ply for hire until this By-law shall have been complied with, neither shall any such driver or conductor drive or conduct any licensed vehicle other than that for which he shall have been so licensed.

13. No driver or conductor of any licensed vehicle shall drive any licensed vehicle other than that having the same number as on his license, nor shall any licensed conductor conduct any licensed vehicle other than that having the number on his license, nor lend or part with his license, nor shall the proprietor of any such vehicle employ an unlicensed person as the driver or conductor thereof.

14 Every proprietor, driver, or conductor of any licensed vehicle, and every vehicle, shall be deemed to be licensed under these By-laws on the production by the Inspector of the License Register Book containing a copy of any such license.

15. Every person or persons and all and every vehicle shall be deemed to be unlicensed unless it appears, on the production of the License Register Book by the Inspector, that a license had been duly issued.

16. The license of the proprietor, driver, or conductor of any licensed vehicle may be cancelled or suspended by the Council (after three days notice in writing signed by the Council Clerk and served upon such proprietor, driver, or conductor, or left at his usual place of abode, calling upon him to show cause why such license should not be cancelled or suspended, and opportunity given such proprietor, driver, or conductor to show such cause), in case either such proprietor, driver, or conductor shall have been convicted of two offences against these By-laws committed within a period of six months next preceding, or in case such proprietor, driver, or conductor shall have twice neglected or refused within a period of one month next preceding to comply with all or any of the By-laws, rules, and regulations for the time being in force within the said Borough relating to such licensed vehicles.

17. Such person or persons as may from time to time be appointed by the said Borough Council shall be the Inspector or Sub-Inspectors of all licensed vehicles plying for hire within the said Borough, and such Inspector or Sub-Inspectors shall as often as he or they may deem necessary inspect all licensed vehicles, and also the harness and horse or horses or other animal or animals used in drawing the same; and if such vehicles, horse or horses, animal or animals, shall in his or their opinion be unfit for public use, he shall report the same in writing to the Mayor, who shall have power to suspend the license of such vehicle until such vehicle, harness, horse or horses, or other animal or animals used in or drawing the same shall be in a fit state for public use; and it shall be the special duty of such Inspector at all times to see that as far as possible these By-laws are duly observed and enforced.

18. No proprietor, driver, or conductor of any licensed vehicle, nor any other person, shall hinder or obstruct such Inspector or Sub-Inspectors in the execution of any of his or their duties.

19. The number of the license granted for every omnibus, waggonette or car, in figures not less than 4 inches in height, and for every hackney carriage in figures not less than 2 inches in height and of proportionate breadth, white upon a ground of black shall be printed or painted outside on the panel of the door or doors of such vehicles, or on a plate or plates fixed thereon, and also upon each lamp used upon such vehicle and the number in figures 2 inches long and of proportionate breadth on the outsides of glasses of lamps as the Inspector may direct, and the proprietor or driver of such omnibus or car, hackney carriage, shall keep such number on such panel of the door or doors, or on such place or places and glasses as aforesaid legible and undefaced during all the time such vehicle shall ply or be used for hire, and the licensed driver of a licensed vehicle shall be deemed to be plying for hire as soon as he shall drive his said vehicle drawn by a horse or horses into any part of any street of the Borough of West Maitland, and it shall not be necessary to prove that such driver had a passenger or passengers in or upon his said vehicle, or for the Inspector to prove payment of any fare.

20. The number of the license of every omnibus, waggonette, car, or hackney carriage on a card or plate 6 inches by 3 inches printed or painted in clear legible figures, and the table of fares so endorsed by the Mayor upon such license as aforesaid, shall be affixed at the upper part of the front panel, or in such other place inside of such omnibus, waggonette, car or hackney carriage, as the Inspector may direct, and the proprietor or driver of such omnibus, waggonette, car or hackney carriage, shall keep such card or plate so affixed and legible and undefaced during all the time such omnibus, waggonette, car, or hackney carriage, shall ply or be used for hire.

21 No proprietor, driver, or conductor of any licensed vehicle shall demand more than the several fares set out in Schedule C. hereto or such other fares as may be at any time substituted therefor by the Council and endorsed on the license of such vehicle.

22. The places specified in Schedule D hereto annexed are hereby respectively appointed public stands for licensed vehicles, provided that the Council may from time to time as they shall see fit, add to, abolish, or alter the number and situation of such stands.

23. The proprietor or driver of any licensed vehicle shall not permit the same to stand for hire except at or from an appointed stand.

24. The driver of any omnibus, waggonette, car, or hackney carriage specially licensed to ply for hire at the public stands at High-street and Church-street Railway Stations shall not so ply at any time other than twenty minutes before the arrival of any passenger train and fifteen minutes after its departure, and no driver of any such omnibus, waggonette, car, or hackney carriage so specially licensed, shall be allowed to ply for hire except to and from such stands.

25. No driver or conductor of any licensed vehicle whilst standing at his proper stand or driving through the streets of the Borough shall endeavour to attract notice by shouting, ringing of bells, blowing of horns, or other noise, nor shall deceive any person in respect of the route or destination of such vehicle by word or sign.

26. The driver of the first omnibus, waggonette, car, or hackney carriage that arrives at any public stand shall be the first to start therefrom with his vehicle, and the others in due rotation in the order in which they arrive at such stands at intervals of no less than five minutes nor remain more than seven minutes on such stand.

27. At every second vehicle on every stand there shall be left a space of at least ten feet, for passengers on foot to pass through.

28. Any licensed driver of any licensed omnibus, waggonette, car, or hackney carriage not specially licensed to ply for hire to and from the Railway Stations of the said Borough having started with such omnibus, waggonette, car, or hackney carriage drawn by one or more horses from either of the public stands at Regent-street or Victoria Bridge, within the said Borough, shall complete the journey to the other of such public stands without turning round or leaving High-street at a pace faster than a walk—that is to say, at an ordinary trot; and no such driver, under any pretence whatsoever, shall permit either horse, should two horses be attached to such omnibus, waggonette, car, or hackney carriage, to canter during such journey or portion thereof; and every such driver shall perform the journey with his said vehicle so drawn as aforesaid from the public stand situate at Regent-street, within the Borough, to the corner of High and Bulwer Streets, within the said Borough, in not less than ten minutes nor more than fifteen minutes; from the corner of High and Bulwer Streets to large lamp at Hunter-street, in said Borough, in not less than five minutes nor more than seven minutes; from the large lamp at Hunter-street, in said Borough, to the Railway Crossing in High-street, in said Borough, in not less than five minutes, nor more than seven minutes, from the Railway Crossing in High-street, within the Borough, to the public stand at Victoria Bridge, within this Borough, in not less than seven minutes nor more than ten minutes; making the whole journey from the public stand at Regent-street to the public stand at the Victoria Bridge in not

less than twenty-seven minutes nor more than than thirty-nine, in due rotation in the order in which each driver shall have started from the said stand at Regent-street. And the foregoing periods of time shall be observed on the return journey from the said public stand at the Victoria Bridge to the said stand at Regent-street, except in the case of the driver of any such licensed vehicle returning with such vehicle from the stand at the Victoria Bridge, who shall be at liberty to go on to the stand at High-street Railway Crossing, to meet the 11 a.m. train from Newcastle, on all days when sales of live stock are to take place at the sale-yards at Campbell's Hill; but no such driver shall on any occasion remain on such Railway Crossing stand for more than ten minutes after the departure of such train, and he shall then proceed on his journey with his vehicle to said sale-yards with his passengers, and at once return to the public stand at Regent-street and take up his position at the rear of the last vehicle on the said stand.

29. The driver of every licensed vehicle, on arrival at any public stand within the said Borough, shall draw up at the end of and be the last of the rank of any vehicles that may be there on such stand. All such vehicles shall be arranged in single rank only.

30. No driver of any licensed vehicle shall suffer the same to stand or loiter in any street or alongside any other vehicle, nor obstruct the driver or conductor of any other licensed vehicle in taking up or setting down any person, or wilfully or wrongfully or forcibly prevent or endeavour to prevent the driver or conductor of any other licensed vehicle from taking a passenger or fare.

31. No driver or conductor of any licensed vehicle shall, when standing on a public stand or plying for hire be at such a distance from the horse or horses attached thereto, as to prevent his having control over the same.

32. The driver of any licensed vehicle taking up or setting down passengers at any place of public worship or public amusement or at any public meeting within the said Borough of West Maitland, or who is waiting for any of those purposes, shall obey the directions of the Inspector as to taking up or setting down, or waiting for passengers, and as to the order and place in which any vehicle shall stand, and every driver shall perform his duty in a careful and quiet manner, and shall not push into or get out of the line or position fixed for the vehicles so as to endeavour to arrive at his place of destination before any other licensed vehicle the driver whereof from its position would have a prior right to take up or set down passengers.

33. No driver or conductor of any licensed vehicle shall, whilst driving, loading, or unloading, or attending any such vehicle, or whilst on any public stand wilfully or negligently do or cause or suffer to be done any damage to the person or property of any one, or be guilty of any breach of the peace, misconduct, or ill-behaviour, or be intoxicated, or make use of threatening, obscene, indecent, profane, abusive, or insulting language, sign, or gesticulation, but shall at all times be sober and careful in the discharge of his duties.

34. Every licensed driver whilst engaged in taking up or setting down any passenger, shall during such taking up or setting down place his vehicle as near as conveniently may be to that side of the street (and at a line with the kerbstone or edge of the footpath) at which such taking up or setting down is required.

35. No licensed driver shall, except when standing on an appointed stand, permit his licensed vehicle, with or without a horse or horses, to stand in any part of the said Borough longer than may be absolutely necessary for loading or unloading, or for taking up or setting down passengers, nor shall he cause any obstruction in any part of the said Borough.

36. Every driver of any licensed vehicle shall keep the same on the left or near side of the road, and shall permit any other vehicle to pass, having the right to do so, and when about to stop such driver shall raise his whip straight up so as to warn the driver of any other vehicle that may be behind.

37. The driver of every licensed vehicle in turning the corner of any street within the said Borough, shall bring the horse or horses drawing such vehicle to a walking pace.

38. No licensed driver of a licensed vehicle shall pass any other licensed omnibus, waggonette, car or hackney carriage, which shall be proceeding in the same direction if the driver of the latter be proceeding on his journey at a pace known as a trot.

39. No licensed driver shall permit his licensed omnibus, waggonette, car, or hackney carriage to be drawn at a pace other than a trot in any street within the Borough of West Maitland.

40. The proprietor of every licensed vehicle shall at all times when the same is plying or employed for hire, make and keep it clean, strong, and in good order in all respects, and if with windows they shall be sound and unbroken, with the leathers or lifts suitable attached to the frame. The horse or horses shall be able and sufficient for their work, free from disease, and properly broken into harness; the harness for each horse shall be perfect, good, and sufficient for the purpose; and every licensed driver or conductor shall be clean in his person, and wear a good hat and other clean and respectable clothes, and conduct himself in a proper and decorous manner.

41. No person suffering from any infectious or contagious disease shall ride in or upon any licensed vehicle, and no licensed driver or conductor shall knowingly carry, or permit to be carried, any such person or (except to some police office, watch-house, hospital, or public house) any corpse, or any person in the state of intoxication, or who is so noisily or violently conducting himself, or otherwise so misbehaving as to occasion any annoyance, or to disturb the public peace. And no passenger shall carry inside any such vehicle any animal or any substance of an offensive character, or that might soil or damage such vehicle, or the apparel of other passengers; and no such driver or conductor shall sleep in or upon any such licensed vehicle, or use the same for eating his meals therein.

42. No driver of any licensed vehicle shall carry more passengers than such vehicle is licensed to carry, nor shall the driver or conductor of any licensed omnibus, waggonette, car, or hackney carriage permit or suffer any person, except the licensed conductor thereof, to be on the footsteps at the back of any such omnibus, waggonette, car, or hackney carriage.

43. No licensed driver or conductor shall smoke tobacco, cigars, or other thing whilst driving or conducting any licensed vehicle engaged on any fare, nor shall any passenger smoke inside or on any such vehicle without the permission of the driver or against the wish of any passenger.

44. The driver and conductor of every licensed vehicle (if such vehicle has a conductor) shall be constantly attendant upon the same, whenever standing, or whilst plying, or engaged for hire.

45. Every licensed vehicle shall be provided with a lamp on each side of the same outside, and the driver of such vehicle when plying for hire thereof between sunset and sunrise, shall light and keep such lamps lighted.

46. The driver of every licensed omnibus, waggonette, car, or hackney carriage shall provide and keep a lamp properly lighted in such a position inside of every such licensed vehicle as the Inspector may direct, whenever such vehicle be plying for hire or engaged at any time between sunset and sunrise.

47. The licensed proprietor or driver of every licensed omnibus, waggonette, car, or hackney carriage shall keep a lamp on each side thereof and on the outside thereof, which shall be such and so placed as to appear white on the front and outsides and red behind.

48. Any licensed proprietor of any one or more licensed vehicles may have a distinguishing light attached to each of such licensed vehicles, and a description thereof shall be inserted in his license; and no proprietor or driver of any other licensed vehicle shall use a similar distinguishing light.

49. Every omnibus, waggonette, car, or hackney carriage for which license shall hereafter be applied for shall be of the dimensions herein directed, and shall be provided with the fittings and furniture detailed and described as follows:—From floor to roof, in line with front of each seat, not less than five feet; from top of seat of cushion to roof, not less than three feet six inches; each seat shall not be less than fourteen inches wide; space from seat to seat, between the inside seats, not less than two feet; the outside seats, when not of the rustic pattern, and all inside seats shall be furnished with good cushions, and sitting space of eighteen inches for each passenger; springs shall be provided to all window frames of an approved pattern effective to prevent noise; a bell or check string to warn the driver to stop when required; two lamps outside, one on each side such omnibus, waggonette, car, or hackney carriage, and one lamp inside, of the colour prescribed by these By-laws.

50. When an application is made for a license for any other omnibus, waggonette, car, or hackney carriage than those in use at the time of the passing of these By-laws, it shall be the duty of the Inspector to see that the fittings and furniture are complete, as detailed and provided for in the last preceding By-law, and are properly affixed to such omnibus, waggonette, car, or hackney carriage, unless it shall be of the dimensions set out in such By-law.

51. Any person having engaged any licensed omnibus, waggonette, car, or hackney carriage and not paying the charge so endorsed as aforesaid upon the license of such vehicle when demanded, shall on conviction thereof forfeit and pay the proprietor or driver of such vehicle such charge, together with such further sum for damages, costs, and expenses for loss of time, or otherwise, as the convicting Justices shall in their discretion think proper.

52. No vehicle which shall be let to hire by special agreement only, or only bespoken at the stables or residence of its owner, and which shall never publicly ply for hire off the premises of its owner, shall be deemed a licensed vehicle within the meaning of these By-laws; nor shall the proprietor, driver, or conductor of such vehicle be subject to the provisions thereof in any respect whatever.

53. Every prosecution under these by-laws may be laid by the Inspector appointed by the Council or by any Sub-Inspector so appointed or by any member of the Police Force of New South Wales (without being so appointed) or by any person or persons whomsoever feeling aggrieved.

54. For every offence against the provisions of any of these By-laws the offender shall be liable to and shall pay a penalty not exceeding ten pounds nor less than ten shillings, and such penalty shall be recoverable before any two Justices of the Peace sitting in Petty Sessions according to the provisions of the Act or Acts for the time being regulating summary proceedings before Justices.

SCHEDULE A.

A requisition for a License.

To the Borough Council of West Maitland.

I, . residing in street, do hereby request that a license may be granted to me, within the said Borough.
Dated the day of 188 .

SCHEDULE B.

License.

This to certify, that is hereby licensed to a certain , number , within the Borough of West Maitland, from the day of the date hereof to the thirty-first day of December next, subject nevertheless to all and every the By-laws, rules and regulations of the said Borough in force relating to such licensed vehicles.

Given under the Common Seal of the Borough Council of West Maitland, this day of , 188 .

Mayor.

SCHEDULE C.

Table of Fares.

For every passenger carried from or between Regent-street stand and the Post Office, the sum of three pence.

For every passenger carried from or between the Post Office and Victoria Bridge stand, the sum of three pence.

For every passenger carried from or between Victoria Bridge stand and the Post Office, the sum of three pence.

For every passenger carried from or between the Post Office and the Regent-street stand, the sum of three pence.

For every passenger carried by the Railway omnibuses from any part of the Borough to either of the Railway Stations of the Borough, the sum of one shilling and the like sum for every passenger carried by such omnibuses from either of such Railway Stations to any part of the Borough.

Double fares to be paid before 6 a.m. and after 10 p.m.

SCHEDULE D.

Public Stands.

No. 1 STAND.—The eastern side of Regent-street, at its intersection with High-street, and thence extending along Regent-street Southerly a distance of 100 yards.

No. 2 STAND.—The northern side of Church-street Railway Station.

No. 3 STAND.—The northern side of High-street Railway Station.

No. 4 STAND.—The northern side of High-street, and extending easterly to within 50 yards of the Victoria Bridge.

Made and passed by the Borough Council of West Maitland, this 30th day of March, A.D. 1886.

(L.S.) ROBERT HYNDES,
Mayor.

THOMAS HUGHES,
Council Clerk.

BOROUGH OF WEST MAITLAND.

BY-LAWS for regulating and licensing Hansom Cabs and Buggies plying for hire within the Borough of West Maitland.

THE Council of the Borough of West Maitland do, by virtue of the power and authority vested in such Council by the Municipalities Act of 1867, hereby make the following By-laws for regulating and licensing hansom cabs and buggies plying for hire within the said Borough of West Maitland, and declare that the same shall stand in the place of and instead of all By-laws heretofore in force, relating thereto which By-laws heretofore made are hereby repealed.

1. In the construction of these By-laws, unless the context shall otherwise indicate the following terms in inverted commas, shall bear the meanings and include the things hereinafter severally assigned or set against them:—

"Council."—The Borough Council of West Maitland.

"Inspector."—The Inspector or Sub-inspector of Vehicles now or hereafter to be appointed by the said Borough Council.

"Proprietor."—Every person who alone or in partnership with any other person shall keep any vehicle for which a license shall or may be obtained by or transferred to him under these By-laws.

"Driver."—Every person engaged or employed in driving any licensed vehicle.

"Passenger."—Every person carried in or upon any vehicle other than the driver.

"Horse."—Horse, mare, gelding.

The word "vehicle" in these By-laws shall include and apply to every hansom cab or buggy. A hansom cab shall mean a vehicle upon two wheels drawn by one horse, and a buggy shall mean a vehicle upon four wheels, drawn by one or more horses, plying for hire within the Borough of West Maitland; and in the construction of these By-laws any word importing the singular number shall be understood to include several persons or things as well as one person or thing, and any word importing the plural number shall be applied to one person or thing, and every word importing the masculine gender shall extend and be applied to a female as well as a male.

2. No person shall ply a vehicle for hire nor shall any person act as driver of any such vehicle within the Borough of West Maitland, unless licensed in the manner hereinafter mentioned, nor during the suspension or after cancellation of such license as hereinafter provided.

3. Before any license shall be granted to the owner or driver of any vehicle, the person requiring such license shall obtain from the Council Clerk, free of charge, a requisition in the form of the schedule hereunto annexed, marked A, or to the like effect, and shall duly fill up and sign the same and deliver it, together with a certificate from two respectable persons, stating that he is of good character, of the required age, and competent for the position under license applied for, to the Inspector, at least twenty-four hours previous thereto.

4. Every proprietor or driver shall, on receipt of a notice to the effect in the Schedule E hereto, produce his vehicle for the purpose of being examined by the Inspector. No license for any vehicle shall be granted or renewed unless the vehicle, horse, or horses, and harness shall have been examined by the Inspector and certified by him in writing to be in a fit state to be licensed. Provided, however, that any party aggrieved by the refusal of the Inspector to grant such certificate may refer the matter to the Council, who shall then decide the same.

5. Licenses for owners or drivers shall be in form provided in Schedule B for each such license respectively, or to the like effect.

6. Every license granted under these by-laws shall be under the common seal of the Council, signed by the Mayor thereof on behalf of the Council, and countersigned by the Council Clerk; and shall be, unless cancelled or suspended as hereinafter provided, in force from the date of such license up to and including the 31st day of December then next ensuing; and no such license shall include more than one vehicle: Provided that if by accident any vehicle shall become unfit for use, it shall be lawful for the owner thereof, during such reasonable time as it shall be undergoing repair, to use another vehicle as substitute; but the substitute shall in all respects, except as to a license, be subject to these by-laws in the same manner as if a license had been granted for it, and the owner using it shall be liable for any non-compliance with these By-laws in respect thereof as if it had been licensed. In order to entitle an owner to the benefit of the above provision, he shall within twelve hours after commencing to use such substitute give notice of his doing so in writing to the Inspector, stating the true cause of his being compelled to use such substitute, and the period during which it will be necessary to do so; and no such substitute shall be used until it shall have been inspected and approved of by the Inspector; or for a longer period than fixed by a certificate to be signed by the Inspector and delivered to the owner.

7. Licenses shall be made out in duplicate by the Council Clerk, or his assistant and numbered in such order as the Mayor shall from time to time direct.

8. For every such license and for every renewal thereof there shall be paid to the said Borough Council the sum of two pounds annually if the license be granted on or after the first day of January, and on or before the thirty-first day of March in every year; and if after that date then the following proportions:—If on or before the thirtieth day of June, the sum of thirty (30) shillings, if on or before the thirtieth day of September, the sum of twenty (20) shillings, and if after that date the sum of ten (10) shillings.

9. The person or persons in whose name or names a vehicle license shall have been obtained shall be deemed the proprietor of the vehicle in respect of which such license shall have been taken out.

10. No license shall be granted to any person to drive any vehicle unless he be above seventeen years of age.

11. Every driver licensed under these By-laws shall whilst driving any vehicle, wear a badge on the left breast outside his clothing, such badge to be furnished free of charge at the time of the issue of the license, and the said driver shall keep the same clean and in good order.

12. No proprietor or driver shall be at liberty to part with or lend his license, and any proprietor transferring or selling his licensed vehicle shall immediately give notice thereof to the Council Clerk, and the transferee or purchaser shall thereupon apply to have the license transferred to him, and shall sign his name in the license book of the said Borough Council and on the license, and until this By-law shall have been complied with the transferor or seller shall remain liable as owner for breach of any of these By-laws, and no transferee or purchaser shall use such vehicle or allow it to ply or shall solicit for hire thereof until this By-law shall have been complied with, neither shall any such driver drive any licensed vehicle other than that for which he shall have been so licensed.

13. No driver of any licensed vehicle shall drive any licensed vehicle other than that having the same number as on his license, nor lend or part with his license, nor shall the proprietor of any such vehicle employ any unlicensed person as the driver thereof.

14. No driver of any licensed vehicle whilst standing at his proper stand or whilst driving through the streets of the Borough shall endeavour to attract notice by shouting, ringing of bells, blowing of horns, cracking of whips, or other noise, nor shall deceive any person in respect of the route or destination of such vehicle by word or sign.

15. At every second vehicle on every stand there shall be left a space of at least five feet, for passengers on foot to pass through.

16. The driver of every licensed vehicle on arrival at any public stand within the said Borough shall draw up at the end of and be the last of the rank of any vehicles that may be there on such stand. All such vehicles shall be arranged in single rank only.

17. No driver of any licensed vehicle shall suffer the same to stand or loiter in any street within the Borough of West Maitland or alongside any other vehicle, nor obstruct the driver of any other licensed vehicle in taking up or setting down any person, or wilfully or wrongfully or forcibly prevent or endeavour to prevent the driver of any other licensed vehicle from taking a passenger or fare.

18. No driver of any licensed vehicle shall, when standing on a public stand or plying for hire thereof, be at such a distance from the horse or horses attached thereto as to prevent his having control over the same.

19. The driver of any licensed vehicle taking up or setting down passengers at any place of public worship or public amusement or at any public meeting within the said Borough of West Maitland, or who is waiting for any of those purposes, shall obey the directions of the Inspector as to taking up or setting down, or waiting for passengers, and as to the order and place in which any vehicle shall stand, and every driver shall perform his duty in a careful and quiet manner, and shall not push into or get out of the line or position fixed for the vehicles so as to endeavour to arrive at his place of destination before any other licensed vehicle the driver whereof, from its position, would have prior right to take up or set down passengers.

20. No driver of any licensed vehicle shall, whilst driving, loading, or unloading, or attending any such vehicle, or whilst on any public stand, wilfully or negligently do, or cause, or suffer to be done, any damage to the person or property of any one, or be guilty of any breach of the peace, misconduct, or ill-behaviour, or be intoxicated, or make use of threatening, obscene, indecent, profane, abusive, or insulting language, sign, or gesticulation, but shall at all times be sober and careful in the discharge of his duties.

21. Every licensed driver whilst engaged in taking up or setting down any passenger, shall during such taking up or setting down place his vehicle as near as conveniently may be to that side of the street (and at a line with the kerbstone or edge of the footpath) at which such taking up or setting down is required.

22. No driver shall, except when standing on an appointed stand, permit his licensed vehicle, with or without a horse or horses, to stand in any part of the said Borough longer than may be absolutely necessary for loading or unloading, or for taking up or setting down passengers, nor shall he cause any obstruction in any part of the said Borough.

23. Every driver of any licensed vehicle shall keep the same on the left or near side of the road, and shall permit any other vehicle to pass, having the right to do so; and when about to stop, such driver shall raise his whip straight up so as to warn the driver of any vehicle that may be behind.

24. The driver of every licensed vehicle, in turning the corner of any street within the said Borough, shall bring the horse or horses drawing such vehicle to a walking pace.

25. No licensed driver shall permit his licensed vehicle to be drawn at a pace other than a trot in any street within the Borough of West Maitland.

26. The proprietor of every licensed vehicle shall at all times when the same is plying or employed for hire make and keep it clean, strong, and in good order in all respects, and if with windows, they shall be sound and unbroken, with the leathers or lifts suitably attached to the frame. The horse or horses shall be able and sufficient for their work, free from disease, and properly broken into harness; the harness for each horse shall be perfect, good, and sufficient for the purpose; and every licensed driver shall be clean in his person, and wear a good hat and other clean and respectable clothes, and conduct himself in a proper and decorous manner.

27. No person suffering from any infectious or contagious disease shall ride in or upon any licensed vehicle, and no licensed driver shall knowingly carry, or permit to be carried, any such person or (except to some Police Office, watch-house, hospital, or public-house) any corpse, or any person in the state of intoxication, or who is so noisily or violently conducting himself, or otherwise so misbehaving as to occasion any annoyance, or to disturb the public peace. And no passenger shall carry inside any such vehicle any animal or any substance of an offensive character, or that might soil or damage such vehicle or the apparel of other passengers; and no such driver shall sleep in or upon any such licensed vehicle.

28. Every proprietor or driver of any licensed vehicle and every vehicle shall be deemed to be licensed under these By-laws on the production by the Inspector of the Licensed Register Book containing a copy of any such license.

29. Every person or persons and all and every vehicle shall be deemed to be unlicensed unless it appears, on the production of the Licensed Register Book by the Inspector, that a license had been duly issued.

30. The license of the proprietor or driver of any licensed vehicle may be cancelled or suspended by the Council (after three days notice in writing, signed by the Council Clerk and served upon such proprietor or driver, or left at his usual place of abode, calling upon him to show cause why such license should not be cancelled or suspended, and opportunity given such proprietor or driver to show such cause), in case either such proprietor or driver, shall have been convicted of two offences against these By-laws committed within a period of six months next preceding, or in case such proprietor or driver shall have twice neglected or refused within a period of one month next preceding to comply with all or any of the By-laws and regulations for the time being in force within the said Borough relating to such licensed vehicles.

31. Such person or persons as may from time to time be appointed by the said Borough Council shall be the Inspector or Sub-Inspector of all licensed vehicles plying for hire within the said Borough, and such Inspector or Sub-Inspector shall, as often as he or they may deem necessary, inspect all licensed vehicles, and also the harness and horse or horses or other animal or animals used in drawing the same; and if such vehicle or vehicles, horse or horses, animal or animals, shall in his or their opinion be unfit for public use, he shall report the same in writing to the Mayor, who shall have power to suspend the license of any such vehicle until such vehicle, harness, horse or horses, or other animal or animals used in drawing the same shall be in a fit state for public use; and it shall be the special duty of such Inspector at all times to see that as far as possible these By-laws are duly observed and enforced.

32. No proprietor or driver of any licensed vehicle, nor any other person, shall hinder or obstruct such Inspector or Sub-Inspectors in the execution of any of his or their duties.

33. The number of the license granted for every licensed vehicle in figures not less than two inches in height and of proportionate breadth, white upon ground of black, shall be printed or painted outside on the panel of such vehicle, or on the boot of such cab, or on a plate or plates fixed thereon, and also upon each lamp used upon such vehicle as the Inspector may direct, and the proprietor or driver of such vehicle shall keep such number on such panel or boot, or on such place or places as aforesaid, legible and undefaced during all the time such vehicle shall ply or be used for hire, and the driver of a vehicle shall be deemed to be plying for hire as soon as he shall drive his said vehicle, drawn by a horse or horses, into any part of any street of the Borough of West Maitland, and it shall not be necessary to prove that such driver had a passenger or passengers in or upon his said vehicle, or for the Inspector to prove payment of any fare to such driver.

34. The number of the license of every vehicle on a card or plate six inches by three inches, printed or painted in clear legible figures, and the table of fares so endorsed by the Mayor upon such license as aforesaid, shall be affixed at the upper part of the front panel, or in such other place inside of such vehicle as the Inspector may direct, and the proprietor or driver of such vehicle shall keep such card or plate so affixed and legible and undefaced during all the time such vehicle shall ply for hire.

35. No proprietor or driver of any licensed vehicle shall demand more than the several fares set out in Schedule C hereto or such other fares as may be at any time substituted therefor by the Council and endorsed on the license of such vehicle.

36. The places specified in Schedule D hereto annexed are hereby respectively appointed public stands for licensed cabs and buggies, provided that the Council may from time to time, as they shall see fit, add to, abolish, or alter the number and situation of such stands.

37. The proprietor or driver of any licensed vehicle shall not permit the same to stand for hire except at or from an appointed stand.

38. No license shall be hereafter granted for any vehicle to be used as a hansom cab unless the said vehicle shall be of the following dimensions:—Height inside, from bottom of floor thereof to roof (in front of seat), four feet ten inches; height inside, from top of seat to roof, three feet six inches; width of seat room, three feet; depth of seat, one foot two inches; space from front of seat to inside of door, eleven inches width; outside, immediately over door, not less than three feet seven inches. Every cab and buggy shall be supplied with proper fittings, and with good and suitable cushions.

39. No licensed driver shall smoke tobacco, cigars, or other thing, whilst driving any licensed vehicle engaged on any fare.

40. The driver of every licensed vehicle shall be constantly attendant upon the same whenever standing, or whilst plying or engaged for hire thereof.

41. Every licensed vehicle shall be provided with a lamp on each side of the same, outside, with the number of the vehicle on the side glasses, two inches long and of proportionate breadth, and kept legible by the driver thereof, and the driver of such vehicle when plying for hire thereof between sunset and sunrise, shall light and keep such lamps lighted.

42. The licensed proprietor or driver of every licensed hansom, cab, or buggy shall keep a lamp on each side thereof, and on the outside thereof, which shall be such and so placed as to appear white on the front and outsides, and red behind.

43. Any licensed proprietor of any one or more licensed vehicles may have a distinguishing light attached to each of such licensed vehicles, and a description thereof shall be inserted in his license, and no proprietor or driver of any other licensed vehicle shall use a similar distinguishing light.

44. Any person having engaged any licensed vehicle and not paying the charge so endorsed as aforesaid upon the license of such vehicle when demanded, shall, on conviction thereof, forfeit and pay the proprietor or driver of such vehicle such charge, together with such further sum for damages, costs, and expenses for loss of time or otherwise, as the convicting Justices shall in their discretion think proper.

45. No vehicle which shall be let to hire by special agreement only, or only bespoken at the stables or residence of its owner, and which shall never publicly ply for hire off the premises of its owner, shall be deemed a licensed vehicle within the meaning of these By-laws; nor shall the proprietor or driver of such vehicle be subject to the provisions thereof in any respect whatever.

46. For every offence against the provisions of these By-laws the offender shall be liable to and shall pay a penalty not exceeding ten pounds nor less than five shillings; and such penalty shall be recoverable before any two Justices in Petty Sessions, according to the provisions of the Act fourteen Victoria number forty-three and the Acts therein adopted.

SCHEDULE A.

A Requisition for License.

To the Borough Council of West Maitland.

I , residing in street, do hereby request that a license may be granted to me to within the said Borough.

Dated this day of , 188 .

SCHEDULE B.

License.

This to certify that is hereby licensed to a certain number , within the Borough of West Maitland, from the day of the date hereof to the thirty-first day of December next, subject nevertheless to all and every the By-laws, rules, and regulations of the said Borough in force relating to such licensed vehicle.

Given under the Common Seal of the Borough Council of West Maitland, this day of , 188 .

Mayor.

SCHEDULE C.

Rates and fares to be paid for any hansom cab or buggy in the Borough of West Maitland.

	s.	d.
For any time not exceeding one quarter of an hour, to carry two passengers if required by hirer	1	0
For every subsequent quarter of an hour or part thereof	1	0
But if engaged for more than one hour, then to be paid at the rate of ninepence for every additional quarter of an hour or part thereof.		

Vehicles to travel at a speed of not less than six miles an hour except when otherwise ordered by the hirer.

The drivers of such vehicles respectively shall be bound to take, if required, exclusive of the driver, two persons inside a hansom cab or buggy. The driver shall not be obliged to take any luggage exceeding fifty pounds in weight, being clean, and of such a description as may be placed inside or outside the vehicle without injuring the same, and the driver shall be entitled to claim one shilling for every additional fifty pounds weight, or portion thereof so carried; but the person hiring such vehicle shall be allowed *eighty-four pounds weight* of luggage when the number of persons is short of the number aforesaid. Whenever the number of persons carried shall exceed that named for each vehicle respectively, the driver shall be entitled to charge by time or distance, as the hiring may be, one-third more for each adult, or two children over five and under fifteen years of age.

Tolls to be paid by the hirer.

Half-fare, in addition to the ordinary fare after 10 p.m. and before 5 a.m.

SCHEDULE D.

Public Stands.

No. 1 STAND.—The north side of High-street, from its junction with Hannan-street to the western side of the Court-house.

No. 2 STAND.—On the north side of High-street, and extending from Messrs. Blair's Gateway, thence seventeen yards eastward along High-street towards their warehouse.

No. 3 STAND.—On the south side of High-street, from four yards east of the Gateway of the Bank of New South Wales, thence extending along High-street twenty-five yards eastward.

No. 4 STAND.—On the north side of High-street, and extending from the lamp at the corner of High and Free Church Streets, twenty-five yards eastward, along High-street towards warehouse of Messrs. E. P. Capper & Sons.

No. 5 STAND.—On the south side of High-street, between the premises of Messrs. Bromhead & Wayland.

No. 6 STAND.—On the north side of High-street, and extending from the eastern boundary of Mr. Waller's premises for twenty-five yards easterly.

No. 7 STAND.—At the intersection of High and Parallel Streets, and extending along Parallel-street a distance of fifty yards.

SCHEDULE E.

I hereby give you notice that you are required to produce your licensed No. at the Council Chambers, West Maitland, on next, the day of , at the hour of o'clock in the for the purpose of having the same inspected by the Inspector of Vehicles.

Council Clerk.

Made and passed by the Borough Council of West Maitland, this thirtieth day of March, A.D. 1886.

(L.S.) ROBERT HYNDES,
Mayor.

THOMAS HUGHES,
Council Clerk.

Sydney: Thomas Richards, Government Printer.—1886.

[6d.]

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(MUNICIPAL DISTRICT OF WENTWORTH.—AMENDED BY-LAW.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 5th August, 1886.

MUNICIPAL DISTRICT OF WENTWORTH.—SUBSTITUTION OF A BY-LAW.

THE following By-law, in substitution of the existing Amended By-law No. 1, made by the Council of the Municipal District of Wentworth, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the "Municipalities Act of 1867."

GEORGE R. DIBBS.

WENTWORTH MUNICIPALITY.—AMENDED BY-LAW.

Change of Hour of Meeting.

THAT instead of existing Amended By-law No. 1, the following shall be substituted:—

The Council shall meet at such place as a majority of the Council shall from time to time appoint for the despatch of business, at the hour of 7·30 p.m. on every alternate Tuesday, unless such day shall happen to be a Public Holiday,—in the latter case the meeting shall be held on such other day as the Mayor may appoint.

Passed at a meeting of the Wentworth Municipal Council, held on the eleventh day of May, 1886.

(L.S.) J. O. EDWARDS,
Mayor.

FREDERICK W. WILKES,
Council Clerk.

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(MUNICIPAL DISTRICT OF PARKES—AMENDED BY-LAW.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 18th August, 1886.

MUNICIPAL DISTRICT OF PARKES.—AMENDED BY-LAW.

THE following Amended By-law relating to the trespass of cattle, &c., made by the Council of the Municipal District of Parkes, in substitution of the By-law No. 78, passed on the 3rd October, 1883, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the "Municipalities Act of 1867."

GEORGE R. DIBBS.

ANY person suffering any swine or any horse, ass, mule, sheep, goat, or other cattle belonging to him or her or under his or her charge to stray or go about or to be tethered or depastured within the town and suburban boundaries of Parkes, in this Municipality, and without the sanction of this Council, shall on conviction forfeit and pay for such offence a sum not exceeding ten pounds or less than ten shillings.

Passed by the Council on 3rd May, 1886.

(L.S.) ROBERT THOMAS,
Mayor.

J. W. FLETCHER,
Council Clerk,
29th June, 1886.

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(MUNICIPAL DISTRICT OF STRATHFIELD—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 11th August, 1886.

MUNICIPAL DISTRICT OF STRATHFIELD—BY-LAWS.

THE following By-laws, made by the Council of the Municipal District of Strathfield, under the "Municipalities Act of 1867," having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the above-cited Act.

GEORGE R. DIBBS.

MUNICIPAL DISTRICT OF STRATHFIELD.—BY-LAWS.

1. That the following be and are hereby confirmed as the By-laws of the Council of the Municipal District of Strathfield.

Meetings of the Council.

Ordinary Meetings.

2. Unless otherwise ordered, the Council shall meet for the despatch of business on every alternate Tuesday, at the hour of 7·30 p.m., unless such day shall happen to be a public holiday; in the latter case the meeting shall be held on such day as the Mayor may appoint.

Election of Chairman in absence of Mayor.—Adjournment for want of quorum.

3. If at any meeting of the Council the Mayor be absent at the expiration of fifteen minutes after the time appointed for holding such meeting, the Aldermen then present shall proceed to elect from among themselves a Chairman for such meeting. Whenever there shall be an adjournment of any such meeting for want of a quorum, the names of the members present shall be taken down and recorded in the minute book.

Course of procedure.

4. The following shall be the course of procedure at such meetings, viz.:—

1. Confirmation of the minutes.
2. Reading and consideration of correspondence.
3. Presentation of petitions.
4. Reports from Committees.
5. Questions.
6. Special matters requiring immediate attention which may be brought under notice by the Mayor.
7. Consideration of tenders.

Business at Special Meetings.

5. At special meetings of the Council, the business, after the minutes shall have been read and verified, which shall be done in the same manner as at an ordinary meeting, shall be taken in such order as the Mayor or Alderman at whose instance the special meeting shall have been called may have directed.

Absence of proposed mover.

6. No motion of which notice shall have been entered on the business paper shall be proceeded with in the absence of the Alderman by whom such notice shall have been given, unless by some other Alderman producing a written authority for that purpose from such first-named Alderman.

Motion to be seconded.

7. No motion shall be discussed unless and until it be seconded.

Motion to be in writing, and not withdrawn without leave.

8. Every motion, notice of which has been given, shall be in writing, shall be signed by the mover; and no motion when seconded shall be withdrawn without leave of the Council.

Amendments may be moved.

9. When a motion shall have been moved and seconded, any Alderman shall be at liberty to move an amendment thereon; but no such amendment shall be discussed unless and until it be seconded.

Only one amendment at the time.

10. No second or subsequent amendment shall be taken into consideration until the previous amendment shall have been disposed of.

Petitions.

11. The Council may at any meeting resolve, without previous notice, that any petition be received, and that the same or any correspondence read be referred to a Committee for report, or that the requests contained therein be granted.

Mayor to preserve order.

12. The Mayor shall preserve order, and may at any time call to order any Alderman who may appear to him to be out of order.

Calls to order.

13. Any Alderman may at any time call the attention of the Mayor to any Alderman being out of order, or to any point of order.

Mayor's decision on points of order final.

14. Every point of order shall be taken into consideration immediately upon its arising, and the decision of the Mayor thereon shall be conclusive, except as hereinafter provided.

Power of Council as to laying down general rules, &c.

15. Any Alderman who is dissatisfied with the decision of the Mayor or Chairman on any such question of order or of practice may, by motion, on notice respectively worded, invite the Council to lay down a different rule or principle for the determination of any similar question of order or of practice which may hereafter arise. Any rule or principle thus laid down shall be binding upon all parties unless and until it be rescinded, but shall have no retrospective operation.

Mayor may take part in proceedings.

16. The Mayor may take part in all the proceedings of the Council or Committees thereof.

Questions put by Mayor.

17. The Mayor shall put all questions first in the affirmative and then in the negative (provided that where an amendment is moved to any motion the amendment shall be put first), and may do so as often as may be necessary to enable him to determine the sense of the Council thereon, and thereupon he shall declare his decision, which shall be final, unless a division be called for.

Mayor to decide as to pre-audience of Aldermen.

18. If two or more Aldermen rise to speak at the same time, the Mayor shall decide which of them shall be entitled to pre-audience.

No Alderman to speak twice on the same question or amendment, except in Committee.

19. No Alderman shall speak twice on the same question, unless in Committee or in explanation, where he shall have been misrepresented or misunderstood: Provided that any Alderman, although having previously spoken, may speak once on every amendment, and that the mover of every question shall always have a right of final reply.

No Alderman to make personal reflections.

20. No Alderman shall digress from the matter under discussion, or make personal reflections on, or impute motives to, any other Alderman.

No Alderman to speak more than fifteen minutes.

21. No Alderman shall speak on any motion or amendment for a longer period than fifteen minutes without the consent of the Council; and every Alderman shall stand when speaking and address the Chair.

Aldermen using offensive expressions to apologize.

22. When any member of the Council shall make use of any language or expression offensive or capable of being applied offensively to any Alderman, the member so offending shall be required to withdraw such language or expression and to make an apology satisfactory to the Council.

Debate may be adjourned.

23. A debate may be adjourned to a later hour the same day, or to another day.

Alderman adjourning debate entitled to precedence on resumption.

24. The Alderman upon whose motion any debate shall be adjourned shall be entitled to precedence on the resumption of the debate.

Adjournments.

25. Any motion for adjournment of the Council, if seconded, shall be immediately put without discussion; but if such motion be negatived it shall not be competent for any Alderman to make a similar motion until thirty minutes shall have elapsed.

Any Alderman may divide Council.

26. It shall be competent for any Alderman to divide the Council on any question, both in full Council and in Committee of the whole Council; and no Alderman shall leave his seat or place till the names of the Aldermen, and how voting, shall have been taken down by the Council Clerk or person officiating for him.

Divisions to be entered on minutes.

27. All divisions of the Council shall be entered on the minutes of the proceedings.

Questions to be read when required.

28. Any Alderman may require the question or matter under discussion to be read once for his information, and upon such request the question or matter under discussion shall be read.

Suspension of By-laws.

29. Any of these By-laws relating to or affecting proceedings at meetings of the Council may be suspended pro tempore, in cases of emergency, by resolution of the Council.

Rescinding motion already passed.

30. No motion to rescind any decision of the Council shall be entertained, except at a Council of the whole specially called for the purpose.

Standing and Special Committees.

Standing Committees.

31. There shall be a Committee of Works and Finance Committee. These Committees shall be re-appointed every year at the first meeting of the Council which shall be holden after the election of Mayor.

Committee of Works.

32. The Committee of Works shall have the general direction of all works ordered or sanctioned by the Council, and the general inspection of all streets, roads, ways, bridges, public reserves, and other places under the management of the Council. They shall also inquire and report from time to time upon such improvements, repairs, or other matters as they may think necessary, or as they may be directed by resolution of the Council to inquire and report upon.

Finance Committee.

33. The Finance Committee shall examine and check all accounts, and shall watch generally over the collection and expenditure of the Municipal revenues; they shall inquire and report from time to time as to all matters which they may consider to affect the finances of the Municipal District, and as to such matters or subjects of the like nature as they may be directed by resolution of the Council to inquire and report upon.

Rules to be observed in Committee.

34. The rules of the Council shall be observed in a Committee of the whole Council, except the rule limiting the number of times of speaking.

Report of Committee to be signed.

35. Every report of a Committee shall be signed by the Chairman thereof.

Protection of Funds and Records.

Member or officer of Council not to be surety.

36. In cases where surety is required by the Municipalities Act, it shall not be competent for the Council to accept as surety any of their members, or any person holding office under the Council.

Custody of records, seal, &c.

37. The common seal, and all charters, deeds, muniments, books, papers, and records of the Council shall be kept in the Council Chambers or office of the Council, in the custody of the Council Clerk, unless the Council shall otherwise order for any purpose; and the common seal shall not be used except with the signature of the Mayor and authority of the Council.

Records, &c., not to be defaced or altered.

38. Any person who shall deface, alter, or destroy, or attempt to deface, alter, or destroy any such common seal, charter, deed, muniment, book, paper, or record shall on conviction thereof forfeit and pay for the first offence a penalty not exceeding fifty pounds nor less than five pounds, and upon every subsequent conviction a penalty of not less than twenty pounds.

Nor removed.

39. Any person who shall remove or attempt to remove (except for the purpose of any legal proceedings) any seal, charter, deed, muniment, book, paper, or record from the Council Chamber, without leave from the Council first had and obtained, shall on conviction thereof forfeit and pay a penalty of not more than twenty pounds nor less than two pounds, and for every subsequent offence a penalty of not less than five pounds.

Expense of proposed works to be first ascertained.—Accounts to be examined by Finance Committee.

40. No work shall be undertaken until the probable expense thereof shall have been ascertained by the Council; and all accounts to be paid by the Council shall be examined by the Finance Committee and reported on by them before any warrant shall be issued for the payment thereof.

Outlay in urgent cases.

41. In cases of emergency arising between meetings of the Council, it shall be lawful for necessary works to be ordered without vote of the Council, viz.:—By the Mayor to the extent of five pounds; and with the consent of three Aldermen, any sum not exceeding twenty pounds.

Levying Rates, &c.

Due dates for rates.—Defaulters.

42. The rates and taxes levied by the Council shall be held to be due and payable on such day or days as the Council shall by resolution from time to time appoint. Every person not paying his or her rates or taxes at the office of the Council, or to the Council Clerk or other proper officer of the Council, within thirty days after any of the days so appointed for payment thereof, shall be deemed a defaulter: Provided that due notice of such rate shall have been given in manner as required by the Municipalities Act of 1867.

Council Clerk to furnish list of defaulters.

43. It shall be the duty of the Council Clerk to furnish the Mayor and Council, or any Committee as directed, with lists of all persons so in default.

Mayor to enforce payment.

44. It shall be the duty of the Mayor to cause such defaulters to be sued for the amount of such rates in any court of competent jurisdiction, or to issue distress warrants against all such persons, and to cause such warrants to be enforced.

Rates on damaged premises.

45. In the event of any premises being wholly or partially destroyed by fire or other accident, the Council shall have power to accept an equitable proportion of the assessed rates of such premises for the remainder of any Municipal year.

Streets and Public Places, &c.

New roads to be reported upon.

46. No new public road, street, way, park, or other place proposed to be dedicated to the public shall be taken under the charge and management of the Council until after such road, street, way, or park shall have been examined by a Committee of Works and reported upon to the Council by such Committee.

Plans of proposed new road, &c., to be deposited.

47. Whenever any proprietor or proprietors of land within the said Municipal District shall open any road, street, or way, or lay out any park or other place for public use or recreation, through or upon such land, and shall be desirous that the Council shall undertake the care and management of such road, street, way, park, or other place, he or they shall furnish the Council with a plan or plans, signed by himself or themselves, showing clearly the position and extent of such road, street, way, park, or other place as aforesaid; and he or they shall execute any instrument dedicating such road, street, way, park, or other place, as the Council may consider necessary.

Temporary stoppage of traffic for repairs, &c.

48. The Council may at any time cause the traffic of any street, lane, or thoroughfare, or any portion thereof, to be stopped for the purpose of repairing the same, or for any necessary purpose; and any person or persons offending against this by-law, either by travelling on such street, lane, or thoroughfare, or by removing or destroying any obstruction that may be placed thereon for the purpose of suspending the traffic, shall forfeit and pay a penalty of any sum not exceeding five pounds for every such offence.

No encroachment allowed on streets, &c.

49. Whenever any road, street, lane, or thoroughfare has been marked out, no house, shop, fence, or other structure shall be allowed (except as hereinafter mentioned) to project or encroach on any part thereof; and in order that the due alignment of the roads, streets, lanes, or thoroughfares within the said Municipal District shall be observed, and that no encroachment shall be made thereon, it shall not be lawful for any person, unless for any temporary or other purposes permitted by the Council, to erect or put up any building, erection, obstruction, fence, or enclosure, or make any excavation or hole on, under, or near such road, street, lane, or thoroughfare, unless due notice of the same shall have been given to the Clerk of the Council at least one week before any such building, erection, obstruction, fence or enclosure, excavation or hole as aforesaid shall be commenced to be erected, or put up, or made, and the assent of the Council first obtained; and in default of the same the person so offending shall forfeit and pay for every such offence a sum not exceeding five pounds nor less than forty shillings, and on every successive conviction for a similar offence shall forfeit and pay a penalty of not less than three pounds.

Obstructing public pathways.

50. If the owner or occupier of any land situate on the side of any street or road in this Municipal District shall permit any tree, shrub, or plant, kept for ornament or otherwise, to overhang any footpath or footway on the side of any such street or road, so as to obstruct the passage thereof, and on demand made by the Council shall not cut, lop, or cause to be lopped, all such trees, shrubs, or plants to the height of eight feet at the least, the said Council, by their servants, labourers, and workmen, may cut, or cause to be cut or lopped, all such overhanging trees, plants, and shrubs, and to remove or burn any portion of such trees, plants, or shrubs so cut or lopped, without being deemed a trespasser or trespassers; and in case any person or persons shall resist, or in any manner forcibly oppose the said Council, or their servants, labourers, or workmen, in the due execution of the powers given in this behalf by virtue of the Municipalities Act of 1867, every person so offending shall on conviction for every such offence forfeit and pay any sum not exceeding ten pounds.

Erection of awnings.

51. No person shall erect an awning in front of any house or shop without first making application to the Council; and any person so doing without authority shall be liable to a fine not exceeding five pounds, and have such awning removed.

Encroachments must be removed on notice.

52. The Inspector of Nuisances or other such officer or person may at any time, on the order of the Council, and upon due notice of thirty days, direct the removal of any building, fence, or other obstruction or encroachment in and upon any road, street, lane, or thoroughfare under the charge of the Council. Notice shall in this case be served either personally or at the usual or last known place of abode of the person to whom such obstruction or encroaching structure belongs, or who has erected the same or caused it to be erected.

Council may remove encroachments.

53. In any case where, after service of notice for the removal of any obstruction or encroachment, the person causing the same shall not remove it within a reasonable time, it shall be lawful for the Council to direct the removal of the same under the superintendence of its own proper officer, and at the cost of the person so offending, provided that the expenses thereby incurred shall in no case exceed the sum of ten pounds, or at the Council's option to proceed against the offender for breach of by-law, the penalty not to exceed twenty-five pounds nor be less than one pound, and in case of every successive offence the penalty, on conviction, not to be less than five pounds.

Or may proceed by action.

54. In every case where the obstruction or encroachment cannot be removed unless at a greater cost than ten pounds, it shall be open to the Council either to direct such removal and to pay all the costs thereof above ten pounds from the funds of the Council, or to proceed by action for trespass against the person causing such obstruction or encroachment, or to proceed as for a breach of such By-laws as aforesaid.

To apply also to obstructions by digging, &c.

55. The foregoing provisions shall be equally applicable to all obstructions by digging or excavation; and any person who shall wilfully obstruct or interfere with the Inspector of Nuisances, or other officer as aforesaid, or any person acting for or under him or either of them, in the exercise of any of the duties or powers by these By-laws imposed or cast on the said Inspector or officer, shall on conviction forfeit and pay a penalty of not less than two pounds nor more than twenty pounds.

Offences.—Nuisances.—General good Order of the Municipal District.

Damaging public buildings, &c.

56. Any person who shall damage any public building, wall, parapet, sluice, bridge, road, street, sewer, watercourse, or other property of the Municipal District, shall pay the cost of repairing the same; and if the same be wilfully done, shall also forfeit and pay a sum not exceeding twenty pounds nor less than five pounds.

Injuring or extinguishing lamps.

57. Any person who shall wantonly or maliciously break or injure any lamp or lamp-post, or extinguish any lamp set up for public convenience in the said Municipal District, shall, over and above the necessary expense of repairing the injury committed, forfeit and pay for such offence any sum not less than one pound nor more than five pounds.

Damaging trees.

58. Any person who shall wilfully and without the authority of the Council cut, break, bark, root up, or otherwise destroy or damage the whole or any part of any tree, sapling, shrub, or underwood growing in or upon any street or place under the management of the Council shall forfeit any sum not exceeding five pounds nor less than one pound.

Throwing dead animals, &c., into any watercourse, &c.

59. Any person who shall throw or cast any filth, rubbish, or any dead animal, or any animal with the intent to drown the same, into any watercourse, river, creek, or canal, or who shall permit or suffer slop, suds, night-soil, sewerage matter, or any filth of any kind to flow or be cast from his or her premises into any such watercourse, waterhole, river, creek, or canal, or who shall permit or suffer any such slop, suds, or filth to flow from his or her premises over any of the footways or streets of the Municipal District, or shall permit or cause, by means of pipes, shoots, channels, or other contrivances, night-soil, sewerage matter, slops, suds, or filth of any kind whatsoever to flow or be cast into any watercourse, waterhole, river, creek, or canal, or shall obstruct or divert from its channel any sewer or watercourse, river, creek, or canal, shall forfeit any sum not exceeding five pounds nor less than one pound, and shall, in addition to any such forfeiture, pay the cost of removing such filth or obstruction, or of restoring such watercourse or canal into its proper channel.

Noisome and offensive trades.

60. No person shall carry on any noisome or offensive trade within the said Municipal District so as to injure or be a nuisance, as hereinafter stated, to the inhabitants thereof.

Gas, vapour, smoke, &c.

61. Any manufacture, trade, calling, or operation in the conducting, following, or carrying on of which, or in consequence of, or in connection therewith, or from the premises where the same is conducted, followed, or carried on, any gas, vapour, or effluvia, or any large quantities of smoke shall be evolved or discharged, which gas, vapour, effluvia, or smoke shall be calculated to injure animal or vegetable life, or in any other way to injure or be a nuisance to the inhabitants of the said Municipal District, shall be considered a noisome and offensive trade within the meaning of these By-laws.

Inspector of Nuisances to inspect and report.

62. Upon complaint in writing by any householder that any noisome or offensive trade is being so followed, conducted, or carried on in the vicinity of his or her residence or property as to injure his or her health, or the health of any member of his or her family, or to be a nuisance to such householder and to his or her family, the Inspector of Nuisances, or any other person or persons appointed by the Council, shall make an inspection of the premises where such trade is alleged to be so conducted, followed, or carried on as aforesaid, and of the premises or property of the complainant, and shall inquire into the grounds of such complaint, and shall report thereon to the said Council; and if the said Council shall, on the consideration of such report, or after any such further inquiry as may be deemed necessary, be of opinion that the said complaint is well founded, and that any manufacture, trade, calling, or operation so complained of, and so being conducted, followed, or carried on as aforesaid, is a noisome or offensive trade within the meaning of these By-laws, notice shall be given to the person or persons conducting, following, or carrying on such trade to cease and discontinue the same within such reasonable time, not being less than two days nor more than seven days, as the said Council may direct, or so to conduct, follow, or carry on his, her, or their manufacture, trade, calling, or operation, as that within such reasonable time as aforesaid the same shall wholly or permanently cease to be noisome and offensive within the meaning of these By-laws, either to the said complainant or to any other resident within the said Municipal District; and if such trade shall not be discontinued as aforesaid, or shall not be so conducted as that it shall wholly cease to be noisome and offensive as aforesaid within the time named in such notice as aforesaid, any person conducting, following, or carrying on such trade as aforesaid shall for every such offence forfeit and pay a sum of not less than ten pounds nor more than fifty pounds.

Like proceedings to apply to any noisome trade about to be commenced.

63. The like proceedings shall be taken as aforesaid whenever there shall be a complaint as aforesaid that any manufacture, trade, calling, or operation is about to be commenced or entered upon which is likely to prove noisome and offensive within the meaning of these By-laws, save and except that the notice to be given as aforesaid shall be given to the person or persons about to commence or enter upon such manufacture, trade, calling, or operation, and shall require him, her, or them not to commence or enter upon the same, or to take such measures as shall effectually and permanently prevent the same from becoming noisome or offensive within the meaning of these By-laws to any resident within the Municipal District. And any person who shall in any case commence, enter upon, or continue any such manufacture, trade, calling, or operation, so as that the same shall be in any way noisome and offensive within the meaning of these By-laws, shall for every such offence forfeit and pay a sum of not less than ten pounds nor more than fifty pounds.

Service of aforesaid notice.

64. Service of such notice as aforesaid upon the occupier or owner of any premises or land wherein or whereon any such manufacture, trade, calling, or operation is being conducted, followed, or carried on, or is about to be commenced or entered upon, or at the last known place of abode of such occupier or owner, or upon any person on the said premises or land, shall be a good and sufficient service of such notice for all purposes of these By-laws; and every person who shall be actually engaged in superintending, directing, or managing, or who shall be in any other way actually engaged or employed in any such manufacture, trade, calling, or operation as aforesaid, shall be liable to be regarded and treated as a person conducting, following, or carrying on such manufacture, trade, calling, or operation within the meaning and for all the purposes of these By-laws.

Throwing filth on roadway, &c.

65. If any person shall in any street, road, lane, or public place throw, cast, or lay, or shall cause, permit, or suffer to be thrown, cast, or laid, any ashes, rubbish, offal, dung, soil, dead animal, blood, or other filth, or shall kill slaughter, dress, scald, or cut up any beast, swine, calf, sheep, lamb, or other animal, in or so near to any of the said streets or roads as that any blood or filth shall run or flow upon or over, or be on any carriage or foot way, or shall run, roll, drive, draw, place, or cause, permit, or suffer to be run, rolled, driven, drawn, or placed upon any footway, any waggon, cart, dray, sledge, or other carriage, or any wheelbarrow or truck, or any cask, or shall wilfully lead, drive, or ride any horse, or other beast upon any footway aforesaid, shall forfeit and pay a sum not exceeding five pounds nor less than one pound.

Damaging or pulling up alignment marks or posts.

66. Any person pulling down or pulling up, destroying, or injuring any alignment or other boundary marks or stones, notice-boards, public notices, or other erection on any reserve, public place, or road, without the authority of the Council, shall forfeit and pay any amount not exceeding ten pounds.

Placing goods, &c., on roadways, &c.

67. If any person shall set or place, or cause or permit to be set or placed, any stall, show-board, basket, or goods of any kind whatsoever, or shall hoop, place, wash, or cleanse, or cause to be hooped, placed, washed, or cleansed, any cask or vessels in or upon or over any road, footway, or public place within the said Municipal District, or shall set out, lay, or place, or shall cause or procure, permit, or suffer to be set out, laid, or placed, any coach, cart, dray, barrow, truck, or other carriage upon any footway, or if any person shall set or place, or cause to be set or placed in, upon, or over any of the said carriage or foot ways any timber, stone, bricks, lime, or other materials or things for building whatsoever (unless the same shall be enclosed as hereinafter directed), or any other matters or things whatsoever, or shall hang out or expose, or shall cause or permit to be hung out or exposed, any meat or offal, or other things or matter whatsoever, from any house or premises over any part of such footways or carriage ways, or over any area of any house or premises, or any other matter or thing, from and on the outside or any part of any house or premises over or next to any such street or road, and shall not immediately remove all or any such matters or things, being thereto required by the Council or any officer thereof, and shall not continue and keep the same so removed, or if any person having, in pursuance of any such requisition as aforesaid, removed or caused to be removed, any such stalls, show-board, basket, goods, coach, cart, dray, barrow, truck, carriage, timber, stone, brick, lime, meat, offal, or other matters or things, and shall at any time thereinafter again set, lay, or place, expose, or cause, procure, permit, or suffer to be set, laid, placed, or exposed, the same or any of them, or any other article or thing whatsoever (save and except as aforesaid) in, upon, or over any of the carriage or foot ways of or next unto any streets or roads as aforesaid, in every such case every person so offending shall forfeit and pay a sum not exceeding forty shillings nor less than ten shillings.

Drawing or trailing timber, &c.

68. If any person shall haul or draw, or cause to be hauled or drawn, upon any part of any street, road, or public place, any timber, stone, or other thing otherwise than upon wheeled carriages, or shall suffer any timber, stone, or other thing which shall be carried principally or in part upon wheeled carriages to drag or trail upon any part of such street or public place to the injury thereof, or to hang over any part of such carriage so as to occupy or obstruct the street or road beyond the breadth of the said carriage, every such person so offending shall forfeit and pay for every such offence the sum of forty shillings over and above the damage occasioned thereby: Provided that such penalty and damages shall not together exceed the sum of ten pounds.

No turf, gravel, &c., to be removed from streets without leave, &c.

69. Any person who from any part of the road, street, thoroughfares, or public places shall remove or cause to be removed, any turf, clay, sand, soil, gravel, stone, or other material, without leave first had and obtained from the officers or persons having lawful charge of such roads, streets, thoroughfares, or public places, or who shall wantonly break up or otherwise damage any part of the said roads, streets, thoroughfares, or public places, shall on conviction forfeit and pay for every such offence any sum not exceeding five pounds nor less than five shillings, and for every subsequent offence shall forfeit and pay a sum of not less than one pound.

No driver to ride on vehicle without a person to guide his beasts (vehicle with reins excepted), or to go a distance from his vehicle, or drive on wrong side, &c.

70. If the driver of any waggon, dray, or vehicle of any kind shall ride upon the same in any street, road, or thoroughfare, not having some person on foot to guide the animals drawing the same (such vehicles as are drawn by horses driven or guided by reins only excepted), or if the driver of any vehicle whatsoever shall wilfully be at such a distance from such vehicle or in such a situation whilst it shall be passing upon such street, road, or thoroughfare that he cannot have the direction or government of the horse or horses or cattle drawing the same, or if the driver of any waggon, cart, dray, coach, carriage, or other vehicle shall not drive on the left or near side of any such road, street, or thoroughfare, or if any

person shall in any manner wilfully prevent any other person or persons from passing him or her on any vehicle under his or her care upon such street, road, or thoroughfare, or by negligence or misbehaviour prevent, hinder, or interrupt the free passage of any person, or vehicle, or carriage in or upon the same, every such driver or person so offending shall forfeit and pay for every such offence any sum not exceeding forty shillings nor less than ten shillings.

As to driving or riding improperly through streets.

71. Any person who shall ride or drive through any road, street, or public place negligently, carelessly, or furiously, or so as to endanger the life or limb of any person, or to the common danger of the passengers, or who shall not carry a light upon any vehicle after an hour after sundown to daylight, shall forfeit and pay a sum not exceeding five pounds.

Affixing placards on walls, and chalking thereon.

72. It shall not be lawful for any person to paste or otherwise affix any placard or other paper upon any wall, fence, house, or building, nor to deface any such wall, fence, house, or building by chalk, paint, or in any other manner, unless with the consent of the owner thereof. Any person who shall be guilty of any such offence shall forfeit and pay a sum not exceeding forty shillings.

Cattle, &c., not to wander about streets, &c.

73. It shall not be lawful for any person to suffer any kind of cattle, horse, ass, mule, sheep, swine, or goat belonging to him or under his charge to stray or go about, or to be depastured in any road, street, or public place in this Municipal District; and any person who shall so offend shall forfeit and pay in respect of every such offence a sum not exceeding forty shillings nor less than five shillings.

As to private avenues.

74. Any owner or occupier of any house, place, or land within the said Municipal District who shall neglect to keep clean all private avenues, passages, yards, and ways within the said premises, so as by such neglect to cause a nuisance by offensive smell or otherwise, or who shall allow stagnant water to become a nuisance on his land, shall on conviction forfeit and pay a sum not exceeding forty shillings for every such offence; and upon the reasonable complaint of any householder that the house, premises, yards, closets, or drains of the neighbouring or adjoining premises are a nuisance or offensive, the Inspector of Nuisances, or any other person appointed by the Council, shall make an inspection of the premises complained of, and the officer of the Council shall have full power, without any other authority than this by-law, to go upon such premises for the aforesaid purpose.

Placing dead animals on premises.

75. Any person who shall place, or cause or suffer to be placed, upon any land or premises within the Municipal District, any dead animal, blood, offal, night-soil, or any other offensive matter, so as to become a nuisance to the inhabitants thereof, shall on conviction suffer and pay a penalty not exceeding five pounds nor less than ten shillings for every such offence.

Allowing dead animals to remain on premises

76. Any occupier or owner of any land or premises who shall suffer or permit any dead animal, blood, offal, night-soil, or any other offensive matter to remain upon the said land or premises after notice shall have been given to remove the same, shall be subject to a penalty not exceeding two pounds nor less than ten shillings for every day that the same shall so remain.

No open closet or cesspit to exist after expiration of three months

77. After the expiration of three months from the date of the passing of these By-laws, no person or persons shall be permitted to have on his, her, or their premises any open closet or cesspit for the deposit of fœcal matter; and any person or persons allowing any such closet or cesspit to remain, after receiving twenty-eight days' notice to remove the same, shall forfeit a sum not exceeding five pounds nor less than one pound; and after such conviction, if such open closet or cesspit be not removed within a further period of fourteen days, shall upon conviction forfeit a further sum not less than five shillings nor more than two pounds for every day that the same shall remain unaltered or unremoved.

Pans for closets.

78. All closets shall be supplied with one or more iron pans with two side handles or one over handle, and shall not be more than fourteen inches in depth and not more than fourteen inches in diameter, and shall be kept in good order to the satisfaction of the Inspector of Nuisances. Breach of this By-law to carry a penalty of not less than ten shillings and not more than forty shillings.

Closets to be approved of by Council's officer

79. No person shall erect, or commence to erect, any closet, or to form, excavate, or make any cesspit, except in such place or position as shall be approved of by the Inspector of Nuisances or other officer of the Council, and the plans and dimensions of same submitted to the Council for approval.

Removal of night-soil.

80. It shall not be lawful for any person or persons to drive, or cause to be driven, any cart or carriage of any kind with any night-soil, ammoniacal liquor, slop, urine, or channel dirt, or filth, in or upon or near to any of the said streets, roads, or other public places; and in order to prevent nuisances it shall not be lawful for any person to deposit night-soil, ammoniacal liquor, or other offensive matter nearer to any street, road, or dwelling-house than shall be directed by the said Council or its officer; and all night-soil and other offensive matter shall be removed within the hours hereinafter prescribed, in properly covered and water-tight carts or other vehicles; and no vehicles used for this purpose shall be allowed to stand on any premises nearer to any street, road, or dwelling-house than shall be directed by the said Council or its officer; and every person offending against this by-law shall, for every such offence, forfeit and pay a sum not exceeding five pounds nor less than ten shillings.

Hours for removing night-soil, &c.

81. If any person shall take away night-soil from any house or premises within the said Municipal District, or shall come with carts or carriages for that purpose, except within the hours of ten at night and five in the morning, or if any person or persons shall cast or permit to leak or slop out of any cart or tub, or otherwise, any night-soil in or near any of the streets or public places, he shall forfeit and pay a penalty of five pounds for every such offence; and in case the person or persons so offending cannot be found, then the owner or owners of such cart, carriage, or other vehicle employed in and about emptying and removing such night-soil, and also the employer or employers of the persons so offending, shall be liable to and forfeit such penalty as aforesaid.

Discharging fire arms, &c.

82 Any person who shall discharge any firearms without lawful cause, or let off any fireworks or any other explosive matter in or near to any road or street, shall forfeit and pay a sum not exceeding five pounds nor less than five shillings.

No rock to be blasted without notice to the Council, &c.

83. Any person who shall be desirous of blasting any rock within the distance of one hundred feet of any dwelling-house, street, road, or other public place shall give forty-eight hours' notice to the Council or any Alderman thereof, who shall appoint a time when the same may take place, and give such other directions as they or he may deem necessary for the public safety; and if any person shall blast, or cause to be blasted, any rock within the limits aforesaid, without giving such notice, or shall not conform to the directions given to him by the said Council, he shall forfeit and pay for every such offence a sum not exceeding five pounds nor less than five shillings.

Cellars or openings beneath footpaths prohibited.

84. It shall not be lawful for any person to make any cellar, or any opening, door, or window, in or beneath the surface of the footway of any road, street, or public place within the said Municipal District except by permission of the Council; and if any person shall so offend he shall forfeit and pay any sum not exceeding five pounds over and above the expense of remedying or removing any such cellar, opening, door, or window, such expense to be assessed and allowed by the convicting Justice or Justices: Provided that such expense and penalty shall not exceed fifty pounds.

Wells to be covered over, &c.

85. Every person who shall have a well between his dwelling-house or the appurtenances thereof and any public place, road, street, or footway within the limits of the said Municipal District, or at the side of such public place, road, street, or footway, or in any yard or place open and exposed to such public place, road, or footway, shall cause such well to be securely and permanently covered over; and if any person having such a well as aforesaid shall fail to cover and secure the same within forty-eight hours after notice in writing shall have been given him or her by any officer of the said Council, or shall have been left at such person's usual or last known abode, or at the said premises, in the manner and with such materials as the Council or its officer shall direct, and to their satisfaction, such person shall forfeit and pay a sum not exceeding five shillings for every day that such well shall remain open or uncovered contrary to the provisions hereof: Provided that, with respect to wells or underground tanks open at the time when this By-law shall come into operation, such penalty shall not be recoverable if the same be properly covered in one month thereafter.

Various obstructions and annoyances.

86. Every person who, in any street, or other place or passage within the said Municipal District, shall commit any of the following offences shall on conviction for any and every such offence forfeit and pay a penalty of not more than two pounds:—

Every person who shall hoist, or cause to be hoisted, or lower, or cause to be lowered, goods of any description from any opening in any house fronting any street or public place, and close to the footway thereof, without sufficient and proper ropes and tackling.

Every person who shall carry or convey, or cause to be carried or conveyed, in any street or public place, the carcass or any part of the carcass of any newly-slaughtered animal, without a sufficient and proper cloth covering the same for the concealment of public view, or shall hawk or carry about butcher's meat for sale without covering the same as aforesaid.

Every person who shall place any line, cord, or pole across any street, lane, or passage, or hang or place clothes thereon to the danger or annoyance of any person.

Every person who shall, within the distance of one hundred yards from any dwelling-house, burn any rags, bones, or cork, or other offensive substance (garden refuse excepted), to the annoyance of any inhabitant.

Every person who shall be the keeper of or have any dog or other animal which shall attack or endanger the life or limb of any person in any street or other public place within the said Municipal District.

Every person or persons who shall persist in playing in a public place any musical instrument or instruments to the annoyance of any ratepayer who may object to it.

Water from roofs.

87. Every owner or occupier of any dwelling-house, shop, or other building who shall permit rain-water to fall from any roof, balcony, or other projection upon any street, road, lane, or footway, or shall cause or permit any such roof or rain-water to be discharged by any pipe upon any such street, road, lane, or footway shall, if such nuisance be not abated within seven days after notice to abate the same shall have been given by the Council, forfeit and pay for every such offence a sum not exceeding five pounds nor less than one pound.

Drains to footpaths.

88. No surface drain shall be made in any footpath, nor any pipes laid under or across the same, without the authority of the Council; and no such pipe or drain shall be used for the discharge into any street or roadway of any offensive liquid or matter of any kind whatsoever; and any person who shall so offend shall forfeit and pay a sum not exceeding five pounds nor less than ten shillings.

Drains for discharge of surface-water from land.

89. Every owner or occupier of land so situated that surface or storm water from or upon the same shall overflow, or shall tend naturally, if not otherwise discharged, to overflow any road, lane, or footway shall, within seven days next after the service of notice by the Council, abate such nuisance where possible; and in default of compliance with any such notice within the period aforesaid, such owner or occupier shall forfeit any sum not exceeding five pounds.

Natural watercourses.

90. Any person who shall close or intercept any natural watercourse, by building or otherwise, shall provide another outlet for the surface-water with pipes or sewers of a size and in a manner to be approved by the Council; and any person failing to comply with the provisions of this By-law shall forfeit and pay a sum not exceeding twenty-pounds nor less than one pound.

Preventing and extinguishing Fires.

Fires or combustible material, &c.

91. Every person who shall place, or knowingly permit to be placed, in any house, yard, workshop, out-offices, or other premises, fire, gunpowder, or combustible or inflammable article of any kind, in such a manner as to endanger contiguous buildings (except with the consent of the owners and occupiers thereof), shall on conviction of every such offence forfeit and pay a penalty of not more than five pounds nor less than one pound, and shall forthwith remove such fire, gunpowder, or combustible or inflammable article; and every such person who shall suffer any such fire, gunpowder, or combustible or inflammable article to remain as aforesaid for forty-eight hours after any such conviction shall be deemed guilty of a further offence against this By-law.

Water Supply.

Polluting water, reservoirs, &c.

92. Whosoever shall bathe in any stream, reservoir, conduit, aqueduct, or other waterworks belonging to or under the management of the Council, or shall wash, cleanse, throw or cause to enter therein any animal, whether alive or dead, or any rubbish, filth, or thing of any kind whatsoever, or shall cause, or permit, or suffer to run or to be brought therein, the water of any sink, sewer, drain, engine, or boiler, or other filthy, unwholesome, or improper liquid, or shall wash any clothes at any public fountain or pump, or in any such stream, reservoir, conduit, or other waterworks as aforesaid, or shall do anything whatsoever whereby any water or waterworks belonging to the said Council, or under their management or control, shall be fouled, obstructed, or damaged, shall, for the first offence, forfeit and pay any sum not exceeding five pounds; for a second offence any sum not less than one pound, nor more than ten pounds for a third and every subsequent offence any sum not less than five pounds nor more than twenty pounds.

Damming-up water without consent.

93. Whosoever shall, without the consent in writing of the Council, construct or place any dam or embankment in or across any river, creek, or natural watercourse shall forfeit and pay any sum not less than one pound nor more twenty pounds, and shall remove such dam or embankment within a reasonable time after such conviction, or shall forfeit and pay any sum not less than five pounds nor more than fifty pounds; and if, after such second conviction, such person shall fail to remove such dam or embankment within a further reasonable time, he shall forfeit and pay a sum of not less than twenty pounds nor more than fifty pounds; and if, within a reasonable time after a third or any further conviction, he shall fail to remove any such dam or embankment, he shall for every such offence forfeit and pay a sum of fifty pounds.

Supply of water in time of drought.

94. In time of drought or scarcity of water the Council may, by resolution to that effect, cause water to be supplied to the inhabitants of the Municipal District by water-carts or otherwise, and shall, by such resolution as aforesaid, fix a price to be charged for water so supplied.

Conduct of Business.

Motions for rescission of previous orders, &c.

95. Whenever a motion for the rescission of any order, resolution, or vote of the Council shall have been negatived, no other motion to the same effect shall be permissible until a period of three months shall have elapsed from the time of negativing such first-mentioned motion: Provided that nothing herein contained shall be held to prohibit the reconsideration and amendment of any proposed By-law which may have been submitted to the Governor for confirmation, and may have been remitted to the Council with suggested amendments of the same, or the passage, after due notice, as hereinafter provided, and in due course of law, of any By-law for the repeal or amendment of any other By-law.

Mode of proceeding in cases not provided for.

96. In all cases not herein provided for, resort shall be had to the rules, forms, and usages of the Legislative Assembly of New South Wales, so far as the same are applicable to the proceedings of the Council.

PART 2.

Collection and enforcement of Rates.—Rates under section 164 of the 31st Victoria No. 12 to be collected half-yearly.

Times and modes of collection.

1. All rates levied or imposed by the Council under the provisions of section 164 of the Municipalities Act of 1867, and for the purpose mentioned in the said section, shall be collected by half-yearly instalments. Each such instalment shall, as to every such rate and every such instalment thereof, be held to be due and payable on and after such days as the Council shall by resolution appoint at the time of making or imposing such rate.

Special Rates.

2. All rates levied or imposed by the Council under sections 165, 166, and 167 of the Municipalities Act of 1867, and for the purposes mentioned in the sections, or under the provisions of any of the said sections, or for any of the purposes mentioned therein, shall be collected in such manner, and shall be held to be due and payable on and after such day or days as the Council may by resolution at the time of making or imposing of such rates, or any of them, have appointed.

Office hours.

3. All rates shall be paid at the Council Chambers during the hours appointed by the Council for that purpose.

Defaulters.

4. It shall be the duty of the Council Clerk to furnish the Mayor with a list of the names of all persons whose rates are unpaid at the expiration of the time fixed for the payment of the same as aforesaid.

Mayor to enforce payment.

5. It shall be the duty of the Mayor to issue distress warrants against all such persons, and to cause such warrants to be enforced, or to cause such defaulters to be sued for the amount of such rates in a Court of Petty Sessions for Small Debts or District Court.

Bailiff.

6. A Bailiff shall, when found necessary, be appointed by the Mayor.

Bailiff's sureties.

7. The Bailiff shall find two sureties to the satisfaction of the Mayor to the extent of twenty-five pounds each for the faithful performance of his duty.

Duty of Bailiff.

8. It shall be the duty of the Bailiff to make all levies by distress for the recovery of rates, in the manner hereinafter provided.

Warrant of distress.

9. All levies and distresses shall be made under warrant, in the form of Schedule A hereto, under the hand of the Mayor or any Alderman who may for the time being be duly authorized to perform the duties of that office.

Distress and sale, &c.

10. If the sum for which any such distress shall have been made shall not be paid, with costs, as hereinafter provided, on or before the expiration of five days, the Bailiff shall sell the goods as distrained, or a sufficient portion thereof, by public auction, either on the premises or at such other place within the said Municipal District as the Bailiff may think proper to remove them to for such purpose, and shall pay over the surplus (if any) that may remain after deducting the amount of the sum distrained for and costs, as hereinafter provided, to the owner of the goods so sold, on demand of such surplus by such owner.

Inventory.

11. At the time of making a distress the Bailiff shall make out a written inventory in the form of Schedule B hereto, which inventory shall be delivered to the occupant of the land or premises, or the owner of the goods so distrained, or to some person on his or her behalf resident at the place where the distress shall be made; and in case there shall be no person at such place with whom such inventory can be left as aforesaid, then such inventory shall be posted on some conspicuous part of the land or premises on which the distress is made; and the Bailiff shall give a copy of the inventory to the ratepayer, on demand, at any time within one month after such distress.

Goods may be impounded.

12. The Bailiff, on making a distress as aforesaid, may impound or secure the goods or chattels so distrained, of what nature or kind soever, in such place or places or in such part of the land or premises chargeable with rates as shall be most fit and convenient for this purpose; and it shall be lawful for any person whomsoever, after the expiration of the five days as hereinbefore mentioned, to come and go to and from such place or part of the said land or premises where such goods or chattels shall be impounded and secured as aforesaid, in order to view and buy and in order to carry off and remove the same on account of the purchaser thereof.

Owner to direct order of sale.

13. The owner of any goods or chattels so distrained upon may, at his or her option, direct and specify the order in which they shall be successively sold; and the said goods or chattels shall in such case be put up for sale according to such direction.

Proceeds of distress.

14. The Bailiff shall hand over to the Council Clerk all proceeds of every distress within forty-eight hours after having received the same.

Costs.

15. There shall be payable to the Bailiff for the use of the Council, for every levy and distress made under this By-law, the costs and charges in the schedule hereunto annexed marked C.

SCHEDULE A.

Warrant of distress.

I, , Mayor of the Municipal District of Strathfield, do hereby authorize you, , Bailiff of the said Municipal District, to distrain the goods and chattels in the dwelling-house (or in and upon the land and premises) of , situated at , for , being the amount of rates due to the said Municipal District to the day of , for the said dwelling-house (or land and premises as the case may be) and to proceed thereon for the recovery of the said rates according to law.

Dated this day of , 188 .

Mayor.

SCHEDULE B.

Inventory.

I have this day, in virtue of the warrant under the hand of the Mayor of the Municipal District of Strathfield, dated , distrained the following goods and chattels in the dwelling-house (or in and upon the land and premises) of , situate at , within the said Municipal District, for , being the amount of rates due to the said Municipal District to the day of , 188 .

Dated this day of , 188 .

Bailiff.

SCHEDULE C.

Costs.	£.	d.
For every warrant of distress	2	0
For serving every warrant and making levy where the sum is not more than £20.....	2	0
Above that sum in addition for every £1	0	1
For making and furnishing copy of inventory	2	0
For man in possession, each day or part of day.....	5	0
For sale, in commission and delivery of goods, per £ on proceeds of the sale	1	0

The foregoing By-laws were passed at a Meeting of the Strathfield Municipal Council, held on the first day of December, one thousand eight hundred and eighty-five.

(L.S.) GEO. HARDIE,
Mayor.

F. G. BENNETT,
Council Clerk.

Sydney: Thomas Richards, Government Printer.—1886.

[6d.]

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(MUNICIPAL DISTRICT OF HAY—BY-LAW.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 20th September, 1886.

MUNICIPAL DISTRICT OF HAY.—BY-LAW.

THE following By-law, made by the Council of the Municipal District of Hay, for regulating driving round corners of streets, roads, and lanes within the Municipality, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the "Municipalities Act of 1867."

GEORGE R DIBBS.

BY-LAW TO REGULATE DRIVING ROUND CORNERS—MUNICIPAL DISTRICT OF HAY.

THE driver of every cart, carriage, dray, wagon, coach, or any other vehicle, whether licensed, public, or private, shall cause the animal or animals drawing the same to proceed at a walking pace around the corners of any streets, roads, or lanes for a distance equal to twenty feet from the corner of such street, road, or lane to a distance of twenty feet past such corner, and on or across any footway. Every person guilty of a breach of this By-law shall be liable to a penalty of not more than £5 nor less than 5s.

Made and passed by the Council of the Municipal District of Hay, under the "Municipalities Act of 1867," at its ordinary meeting held on Thursday, 24th June, 1886.

(L.S.) WM. TRAVIS,
Mayor.

HENRY THOS. HAYNES,
Town Clerk.

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(BOROUGH OF SINGLETON—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 1st October, 1886.

BOROUGH OF SINGLETON.—BY-LAWS.

THE following By-laws made by the Council of the Borough of Singleton, under the "Municipalities Act of 1867," having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the above-cited Act.

GEORGE R. DIBBS.

BOROUGH OF SINGLETON.

AMENDED BY-LAWS of the Borough of Singleton, under the provisions of the "Municipalities Act of 1867."

By-laws repealed.

By-laws numbered 105, 120, 132, and 133, in the code of By-laws made and passed by the Municipal Council of Singleton, on the 9th June, 1880, are hereby repealed.

Lights to be placed on vehicles.

140. Every person driving any vehicle within the Borough, between sunset and sunrise, shall carry two lights, one on each side of the outside of such vehicle, in a conspicuous place; and every person riding on a bicycle or tricycle as aforesaid shall carry a conspicuous light attached thereto. Any one offending against this By-law shall be liable to a penalty not exceeding one pound nor less than two shillings and sixpence.

Driving and riding round street corners.

141. Any person who shall ride on horseback or on any bicycle or tricycle or drive in a vehicle round the corners of any street within the Borough at a pace faster than a walk shall on conviction forfeit and pay any sum not more than one pound nor less than two shillings and sixpence.

Loitering &c. on streets.

142. All persons standing, laying down, kneeling down, or loitering upon any of the footways, carriageways, or other public places in the Borough, to the inconvenience of the passers-by, or in any way either singly or collectively interrupting the traffic, who shall not discontinue to do so on being required by any officer of the Council of the Borough or by any police constable, shall be liable to a penalty not exceeding two pounds no less than five shillings.

Licensing vehicles, carts, and timber carriages.

143. All owners of vehicles plying or carrying passengers, goods, or other materials for hire, all water, firewood, and coal carters, and all owners of vehicles used for selling or hawking vegetables and fruit in the Borough shall be licensed by the Council, and the license fee shall be at the rate of seven shillings and sixpence per wheel per annum.

144. The owner of every timber-carriage or vehicle used for that purpose, or dray attached as a substitute for the conveyance of timber, using the streets of the Borough with such timber-carriage, vehicle, or dray as aforesaid, for the conveyance of timber in logs or otherwise, shall be licensed by the Council, and the license fee shall be at the rate of ten shillings per wheel per annum.

145. The owners of all vehicles, carts, water-carts, and timber-carriages licensed under the foregoing By-laws numbered 143 and 144 respectively shall have their names and places of abode painted in legible letters at least two inches high and proportionately broad, in white letters on a black ground, on the off side of each such vehicle, cart, water-cart, and timber-carriage respectively. All such licenses shall be issued for a period of twelve months terminable on the 30th June, in each year; and every owner who shall omit or fail to comply with the provisions of this or any of the foregoing By-laws numbered 143 and 144 respectively shall forfeit a sum not exceeding five pounds nor less than two pounds.

146. The word "vehicle" in any of the foregoing By-laws shall mean and apply to any omnibus or other conveyances carrying passengers, cart, van, wain, waggon, or dray used for any of the purposes mentioned therein.

Parks and Recreation Grounds.

147. No person shall climb any of the trees or climb or jump over the seats or fences, or shall lie or stand on any of the seats therein.

148. No person shall cut, break, or deface any of the trees, shrubs, plants, seats, gates, posts, or fences, or write thereon, or shall affix any bill or stencil mark to any tree, seat, gate, post, fence, wall, pillar, or to any building or other erection or on any pavement or footway therein

149 No person shall walk on the grass edging bordering any path therein.

150. No person unless authorized by the Borough Council shall offer or expose any article for sale therein.

151. No person shall engage in or train for any race or game, or throw any stone or other missile, or deposit therein any bottle, broken glass, fruit skins, bones, paper, cast off clothing, or litter of any kind; and no person shall light fires therein or annoy visitors.

152. No person in a state of intoxication or of reputed bad character shall enter or remain therein, and no person shall behave in a disorderly or offensive manner, or use any bad language, or commmit any act of indecency therein.

153 No person shall depasture any horses, cattle, sheep, or stock of any kind therein without proper authority; and no dogs shall be admitted therein.

154. All goats or poultry found therein may be destroyed by any officer of the Council or police constable.

155. No public meeting or assemblage for any purpose shall be permitted therein without the consent of the Singleton Borough Council, in writing, having been obtained previously, and all persons taking part in any such meeting or assemblage without such written consent as aforesaid being first had and obtained may be at once removed therefrom by any officer of the Council or police constable, and shall further be liable to the penalty hereinafter mentioned.

156. The foregoing By-laws numbered 147, 148, 149 150, 151, 152, 153, 154, and 155 shall be applicable to all Parks and Recreation Grounds under the control and management of the Singleton Borough Council; and every person committing of breach of the aforesaid By-laws shall be liable to a penalty a five pounds nor less than two pounds.

Made and passed by the Municipal Council of Singleton, this tenth day of June, in the year one thousand eight hundred and eighty-six.

C. POPPENHAGEN, Council Clerk. (L.S.) F. KING, Mayor.

1885-6.

NEW SOUTH WALES.

MUNICIPALITIES.

(MUNICIPAL DISTRICT OF TAREE—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 158.

Colonial Secretary's Office,
Sydney, 14th October, 1886.

MUNICIPAL DISTRICT OF TAREE.—BY-LAWS.

THE following By-laws, made by the Council of the Municipal District of Taree, under the "Municipalities Act of 1867," having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the above-cited Act.

GEORGE R. DIBBS.

BY-LAWS FOR THE MUNICIPAL DISTRICT OF TAREE, 1885.

BY-LAWS made and passed by the Municipal Council of Taree for regulating the proceedings of the Council, the duties of their officers and servants, for compelling residents to keep their premises clean, and generally for the proper government of the Municipality, in accordance with the requirements of "Municipalities Act of 1867."

1. The Council shall meet for the despatch of business at the hour of 7 p.m. on every alternate Wednesday, unless such day shall happen to be a public holiday; in the latter case, the meeting shall be held on such other day as the Mayor may appoint.

2. If the Mayor shall be absent at the expiration of twenty minutes after the time appointed for the holding of any meeting, the Aldermen present shall choose a Chairman: Provided always that if the Mayor shall afterwards attend such Alderman shall leave the chair to be taken by the Mayor.

3. Whenever any meeting shall lapse, or be adjourned for want of a quorum, the names of the members present shall be recorded by the Council Clerk.

4. The business of each ordinary meeting shall be transacted in the following manner, viz.:—

1. Reading and confirming minutes of previous meeting or meetings.
2. Petitions (if any) to be presented and dealt with.
3. Correspondence to be read and dealt with.
4. Reports from Committees and minutes from the Mayor to be presented and ordered upon.
5. Questions as to matters under the jurisdiction or within the official cognizance of the Council to be put and replied to.

Motions on notice to be dealt with in their respective order.

Orders of the day, which shall comprise all business set down for the day by order of any previous meeting or necessarily arising out of the proceedings of a former meeting. The Council may, by resolution, take any particular matter out of the regular order on the business paper.

Power to suspend By-laws.

5. The Council shall have power to suspend, pro tem., one or more of the By-laws: Provided that no such suspension shall be allowed for the purpose of voting money, and that two-thirds of the members present consent.

Postponement of debate on motion.

6. Any debate or order of the day when called on may be postponed to another time to be duly specified: Provided that no discussion shall be allowed upon such motion for adjournment, and the Alderman upon whose motion any debate shall be adjourned shall be entitled to open the debate on resumption.

Notices of motion, &c., to be numbered as received, and preserved until matter disposed of.

7. All notices of motion, &c., for consideration at general meetings shall be delivered to the Council Clerk at least four days before such meeting, in writing, and shall be numbered by him as they are received, and entered on the business paper according to their number; and each notice shall be preserved by such Clerk until after the matter to which it relates shall have been disposed of: Provided, however, that the person giving or forwarding any such notice of motion, &c., shall be at liberty to withdraw the same at any time before the making-up of the business paper.

Motions to be in writing and seconded.

8. All resolutions proposed and all amendments shall be submitted in writing, and no motion or amendment shall be discussed unless and until it be seconded.

Motions not to be withdrawn.

9. No motion, of which notice has been given, shall be withdrawn if any Alderman object; and if any Alderman who has given notice of motion fail or decline to move it, the Mayor or any other Alderman may move the same.

Questions may be put.

10. No question shall be put to the Mayor when in Council requiring the production of papers, or which cannot be replied to without reference to books or papers, unless twenty-four hours notice in writing shall have been given thereof to the Council Clerk.

Amendments, and order of.

11. When any motion of Council shall have been made and seconded, any Alderman may move an amendment thereon; and if an amendment be carried, the question as amended thereby becomes itself the question before the Council, whereupon any further amendment upon such question may be moved. If any amendment shall be negatived, then a further amendment may be moved to the question which such first-mentioned amendment was moved, and so on: Provided that not more than one question and one proposed amendment thereof shall be before the Council at any one time.

Fixing salaries.

12. When any motion or amendment relates to the fixing of salaries or rates or other matters of finance, the lowest sum shall be put first, then the next lowest, and so on to the highest.

Motions for adjournment.

13. Any motion for adjournment shall be put immediately without discussion. If such motion be negatived, the business then under consideration or the next in order on the business paper shall be discussed before any notice for adjournment may be moved.

Divisions.

14. Any Alderman may call for a division; in such case the question shall be put first in the affirmative and then in the negative, and the Aldermen shall vote by show of hands, and the names and votes of the Aldermen present shall be recorded; and any Alderman present when a division is called for who shall not vote (not being disabled by law for so doing) shall be liable for every such offence to a penalty of ten shillings.

Motions that would rescind.

15. No motion, the effect of which if carried would be to rescind any resolution passed by the Council during the current Municipal year, shall be entertained unless at a special meeting of the Council called for that purpose; and no such motion, if negatived by the Council at such special meeting, shall be again entertained during the same Municipal year.

Aldermen not to speak more than ten minutes.

16. No Alderman shall speak twice on any motion or amendment without the consent of the Council, except when in Committee or in explanation, where he shall have been misrepresented or misunderstood. The mover of every question shall have the right of reply: Provided that no Alderman shall speak upon any motion or amendment for a longer period than ten minutes.

To stand when speaking.

17. Every Alderman shall stand when speaking, unless prevented by bodily infirmity, and shall address the chair.

Privilege of Mayor or Chairman.

18. The Mayor or Chairman shall have the same privilege as any other Alderman in making or seconding a motion, and have the right of speaking on any subject or amendment introduced. The Mayor or Chairman shall rise when so speaking, but shall be considered as still presiding.

Offensive personal statements.

19. No Alderman shall make offensive personal reflections upon, or impute discreditable motives to, any other Alderman. Any Alderman so offending shall immediately, upon being thereto required by the Mayor or presiding Alderman, withdraw the offensive expressions and retract any such imputation of motive, and make an apology satisfactory to the Council. Any Alderman declining so to apologize and to withdraw the offensive expressions or to retract the imputation of motive shall be liable on conviction to a fine or penalty of not less than one pound nor more than five pounds for the first offence, and on a second conviction for a like offence he shall be liable to a fine or penalty of not less than two pounds. Any Alderman may move without notice that the offensive words be taken down, and when this has been done it shall be prima facie evidence of such words having been used.

Committee of the Council.

20. The rules of the Council shall be observed in Committee of the Whole, except the rule as to standing and that limiting the number of times of speaking. It shall be competent for any Alderman to move that any subject matter, motion, or order of the day be considered in committee, and should the Council so decide that such business be considered in Committee, the Council as may thereupon be decided, may go into Committee or otherwise.

Points of order.

21. Any Alderman may at any time call the attention of the Mayor or Chairman to any Alderman being out of order, and every point of order shall be taken into consideration immediately upon its arising, and the decision of the Mayor or Chairman thereon shall be conclusive.

Speaking.

22. Any Alderman who has moved any motion or amendment shall be considered to have spoken thereon, but no Alderman who shall have seconded any such motion or amendment without any further observation than that he seconded the same shall be at liberty to speak on such motion or amendment.

Petitions.

23. Any Alderman presenting a petition shall satisfy himself that the wording thereof is respectful and in order. All petitions shall be received only as the petitions of the persons signing the same; and no debate shall take place upon the presentation of a petition until notice has been given in the usual manner.

Committees.

24. There shall be three Standing Committees—the Finance, Improvement or Works, and By-law Committees; and each such Committee shall consist of three Aldermen, and may be called together at any time by direction of any one member of such Committee.

Reports from Committees.

25. All reports upon Standing Committees to be presented in writing and signed by the chairman or any two members of such Committee. The Mayor shall have the right of directing the attention of the Council to any matter or subject within its jurisdiction by a minute in writing.

Works and tenders.

26. Works undertaken by the Council and estimated to cost over ten pounds to be let by tender. Estimates of the cost of all works determined upon shall be laid before the Council, on the report of the Works Committee, before the contract is entered into for such works.

Urgent works may be ordered.

27. The Mayor, or in his absence any two Aldermen of Works Committee, may order any sum not exceeding ten pounds to be expended in repairing any public work under the control of the Council which may be suddenly damaged, and such order shall be reported at the next meeting of Council.

Payment, how made.

28. No money shall be paid by the Council until the account for the same shall have been examined by the Finance Committee and approved of by the Council.

Common seal, &c.

29. All charters, deeds, muniments, and records of the Municipality shall be kept in the office thereof, in the custody of the Council Clerk, unless the Council shall otherwise order. All papers, deeds, contracts, and agreements requiring to be sealed with the common seal shall be witnessed by the Mayor and the Council Clerk. For the purpose of authenticating documents the common seal may be attached thereto, witnessed by the Mayor and Council Clerk, for which a fee of five shillings shall be paid.

Rates to be paid.

30. The rates of the Municipality shall be collected half-yearly, and shall be due and payable on such days as the Council shall determine at the time of making the assessment, or in such other day as the Council may direct. All persons liable to pay rates or assessments shall pay the same to the Council Clerk, or such other officer as may be appointed for that purpose, at the Municipal Council Chambers during office hours, on such days as may from time to time be appointed by the Council.

Council Clerk.

31. The Council Clerk shall be required to enter into an approved bond into double the amount of his salary for the faithful performance of his duties.

Bailiff.

32. The Bailiff shall make all levies and distress under warrant signed by the Mayor in the form of schedule marked A hereunto annexed, and shall be paid for every such entry and levy made under these By-laws the fees as per Schedule B annexed herewith. He shall enter into a bond for the due performance of his duties.

Distress and inventory.

33. At the time of making a distress the Bailiff shall make out a written inventory in the form of the schedule hereto annexed and marked C, which inventory shall be delivered to the occupant of the premises, or the owner of the goods so distrained, or to some person for his or her behalf resident at the place where the distress has been made.

Preventing and extinguishing fires.

Fire or combustible materials, &c.

34. Every person who shall place or knowingly permit to be placed in any house, yard, or workshop, out-offices, or other premises, fire, gunpowder, or combustible, or inflammable materials of any kind, in such a manner as to endanger any buildings, shall on conviction for every such offence forfeit and

pay a penalty of not more than ten pounds, and shall forthwith remove such fire, gunpowder, or combustible or inflammable materials. And every such person who shall suffer any such fire, gunpowder, or inflammable materials to remain as aforesaid for a period of twelve hours after any such conviction shall be deemed guilty of a further offence against against this by-law.

Lighting bonfires.

35. Any person who shall light any bonfire, tar-barrel, or fireworks upon or within twenty yards, or shall discharge any firearms within sixty yards, of any public or private street or any public place, or shall sell fireworks, squibs, or rockets by gas, candle, or artificial light, shall forfeit a sum not exceeding five pounds.

Setting on fire chimney-flues.

36. Every person who wilfully sets or causes to be set on fire any chimney-flue, smoke-vent, or stove-pipe shall forfeit a sum not exceeding five pounds.

Chimneys catching fire by neglect.

37. If any chimney catch fire through the wilful neglect of any person occupying or using any premises in which such chimney is situated, he shall forfeit a sum not exceeding forty shillings: Provided always that such forfeiture shall not be enforced if such person prove to the satisfaction of the Justices before whom the case is heard that such fire was in nowise owing to the neglect or carelessness, whether with respect to cleansing such chimney or otherwise, of himself or his servant.

Water-carts, licensing of

38. The Council shall from time to time license to ply within the Municipality such carts, for the carrying and sale of water and extinguishing fires, as shall on inspection be found fit for that purpose. Every such cart or vessel for the holding of water for the purposes aforesaid shall be capable of containing not less than fifty gallons, and shall have the name of the owner and the words "Licensed Water Cart" painted on such cart in legible letters.

Vehicles, &c., plying for hire to be licensed.

39. All water-carters, firewood-carters, and owners of vehicles plying or carrying passengers, goods, or other materials for hire shall be licensed by the Council, and the owners shall have their names painted in legible letters, with the word "Licensed" on some conspicuous part of such vehicles respectively. The license fee shall be at the rate of ten shillings per wheel per annum. And all such licenses shall be issued for a period of twelve months, terminable on the 30th day of June in each year. And every owner who shall omit or fail to comply with the provisions of this By-law shall forfeit a sum not exceeding forty shillings nor less than ten shillings.

Penalty for hawking or carrying water for sale without a license.

40. Any person hawking or carrying water for sale or hire within the Municipality, otherwise than in a licensed water-cart as aforesaid, shall upon conviction be liable to a penalty not exceeding one pound.

Streets and public places.—Public health and decency, &c.

New roads to be reported on.

41. No new public road, street, way, reserve, or other place proposed to be dedicated to the public shall be taken under the charge and management of the Council until after such road, street, way, or reserve shall have been examined by the Committee for Works, and reported upon to the Council by such Committee.

Plans of proposed new roads to be delivered to the Council.

42. When any proprietor or proprietors of land within the said Municipality shall open any road, street, or way, or lay out any park or other place for public use or recreation through or upon such land, and shall be desirous that the Council shall undertake the care and management of such road, street, way, reserve, or other place, he or they shall furnish the Council with a plan or plans, signed by himself or themselves, showing clearly the position and extent of such road, street, way, reserve, or other place as aforesaid.

Dedications of new roads, &c.

43. If the Council determine to take charge of any such road, way, or other place as aforesaid, the plan or plans so signed as aforesaid shall be preserved as a record or records of the Council; and the proprietor or proprietors aforesaid shall execute such further instrument dedicating such road, way, reserve, or other place to public use or recreation as aforesaid as may be considered necessary by the Committee for Works; and such instrument of dedication shall also be preserved as a record of the Council.

Committee for Works to fix street levels.

44. The Committee for Works, or any officer or person acting under the supervision of such Committee, shall, subject to such orders as shall from time to time be made by the Council in that behalf, fix and lay out the levels of all public roads, streets, and ways within the Municipality, and the carriage and foot ways thereof. And it shall be the duty of such Committee, officer, or person to place posts at the corners of intersections of any such public roads and streets wherever the same may be considered necessary or desirable by the the Council: Provided that there shall be no change of level in any such public road, street, or way until the same shall have been submitted to and adopted by the Council as hereinafter directed. Whenever it may be deemed necessary to alter the level of any such public road, street, or way as aforesaid, the Committee for Works shall cause a plan and section showing the proposed cutting to be exhibited at the Council Chambers for seven days, for the information and inspection of ratepayers, and shall notify by advertisement in some newspaper circulating in the Municipality that such plan is so open to inspection; and no objections thereto shall be entertained by the Council unless made within twenty-one days after such notice shall have been given at a subsequent meeting of the Council. The said plan and section shall, if adopted, be signed by the Mayor or Chairman and the proposer and seconder of the motion for such adoption, and countersigned by the Town Clerk; and such plan and section so signed and countersigned shall be a record of the Council.

No turf, gravel, &c, to be removed from streets without permission.

45. Any person who shall form, dig, or open any drain or sewer, or remove or cause to be removed any turf, clay, sand, soil, gravel, stone, or other material, or any road scrapings or sweepings, in or from any part of the carriage or foot ways of any street or any other public place within the said Municipality, without leave first had and obtained for that purpose from the Council, or who shall wantonly break up or otherwise damage any such carriage or foot way shall on conviction forfeit and pay for every such offence any sum not exceeding five pounds nor less than one pound. And any person who shall have or make any cellar or any opening, door, or window in or beneath the surface of the foot-way or any street or public place within the said Municipality, without the consent of the Council, shall on conviction forfeit and pay the sum of five pounds over and above the expense of filling up, remedying, or removing such cellar, opening, door, or window.

Holes to be enclosed.

46. Any person or persons who shall dig or make, or cause to be dug or made, any hole, or leave, or cause to be left, any hole adjoining or near to any street or public place within the said Municipality for the purpose of making any vault or vaults, or the foundation or foundations to any house or building, or for any other purpose whatsoever, or shall erect or pull down any building, and shall not forthwith enclose the same and keep the same enclosed in a good and sufficient manner, to the satisfaction of the Committee of Works of the said Municipality, or shall keep up or cause to be kept up and continued any such enclosure for any time which shall be longer than shall be absolutely necessary in the opinion of said Committee, and shall not place lights upon each side of the said enclosure and keep the same constantly burning from sunset to sunrise during the continued existence of such enclosure, shall forfeit and pay for every such refusal or neglect any sum not being less than forty shillings nor exceeding five pounds.

Open spaces and steps adjoining footways to be enclosed, under a penalty.

47. Every owner or occupier of any house, building, or premises, or land within the said Municipality, having any entrance, area, garden, or other open space, or any vacant building lot, waterhole, or excavated space adjoining the footway of any street or public place in such Municipality, shall protect and guard the same by good and sufficient rails, fences or other enclosures, to be previously approved of by the Work Committee or any officer whose special duty it shall be to attend to such work, so as to prevent danger to persons passing and repassing; and every such owner or occupier of any such house building, premises, or land having any steps adjoining the foot way of any such street or public place, shall in like manner protect and guard the same by fences, rails, or other enclosure so as to prevent the like danger to persons passing and repassing; and on failure thereof every such owner or occupier shall as often as he or she shall be convicted of such offence forfeit and pay a sum not being less than forty shillings nor more than five pounds; and every such owner or occupier as aforesaid, who shall fail to erect such fences or other enclosures as aforesaid after fourteen days notice from the Council or any duly qualified officer, shall be deemed guilty of a further offence against this By-law.

Penalty for not covering over wells.

48. Every person who shall have a well or excavation situated between his or her dwelling-house or the appurtenances thereof, and every road, street, or footway within the limits of the said Municipality shall cause such well to be securely and permanently covered over; and if any person having such well as aforesaid shall fail to cover over and secure the same within twenty-four hours after notice in writing shall have been given to him or her by any officer of the said Council, or shall have been left for any such person at his or her usual or last known place of abode, or on the said premises, shall on conviction

forfeit and pay a sum of ten shillings, and for every day after such notice that such well shall remain so uncovered, contrary to the provisions hereinbefore made and provided, such person shall be deemed guilty of a separate offence against this By-law.

Temporary stoppage to traffic for repairs.

49. The Committee for Works, or any officer or person acting under the authority of such Committee of the Council, may at any time cause the traffic of any street, lane, or thoroughfare, or any portion thereof, to be stopped for the purpose of repairing the same, or for any necessary purpose; and any person or persons offending against this By-law, either by travelling on such street, lane, thoroughfare, or by removing or destroying any obstruction that may be placed thereon for the purpose of suspending the traffic, shall forfeit and pay a penalty of any sum not exceeding five pounds for every such offence.

Drawing or trailing timber, &c.

50. Any person who shall haul or draw timber, or cause to be hauled or drawn, upon any part of any street or public place within the said Municipality, any timber, stone, or other thing otherwise than upon wheeled vehicles or barrows, or shall suffer any timber, stone, or other thing which shall be carried principally or in part upon any wheeled vehicle or barrow to drag or trail upon any part of such street or public place, to the injury thereof, shall upon conviction forfeit and pay for every such offence a sum not more than forty shillings nor less than five shillings over and above the damage occasioned thereby.

Driving on footpaths and throwing filth thereon.

51. Any person who shall throw, cast, or lay, or shall cause, permit, or suffer to be thrown, cast, or laid, or to remain, any ashes, rubbish, offal, dung, soil, dead animal, blood, or other filth or annoyance, or any matter or thing in or upon the carriage-way or foot-way of any street or public place in the said Municipality, or shall kill, slaughter, dress, scald, or cut up any beast, swine, calf, sheep, lamb, or other animal in or so near to any such street or public place as that any blood or filth shall run or flow upon or over, or be on any or either of any such carriage or foot way, or shall run, roll, drive, draw, place, or cause, permit, or suffer to be run, rolled, driven, drawn, or placed upon any of the said foot-ways of any such street or public place, any waggon, cart, dray, sledge, or other carriage, or any wheelbarrow, handbarrow, or truck, or any hogshead, cask, or barrel, or shall wilfully lead, drive, or ride any horse, ass, mule, or other beast upon any such foot-way shall upon conviction thereof forfeit and pay for the first offence a sum not exceeding forty shillings nor less than five shillings, for the second offence a sum not exceeding five pounds nor less than ten shillings, and for a third and every subsequent offence a sum not exceeding ten pounds nor less than one pound for each such offence.

Lights to be placed on vehicles.

52. Every person driving any vehicles within the Municipal District between sunset and sunrise shall carry a light on such vehicle in a conspicuous place; any one offending against this by-law shall be liable to a penalty not exceeding two pounds nor less than ten shillings.

Destroying kerbstone, gutters, pathways, &c.

53. No driver, carter, or other person shall wilfully or negligently do or suffer, or cause to be done, any damage or injury to the kerbstones, gutters, or pathways of any street or roadway; and no person shall be at liberty to drive a wheeled vehicle of any kind, or ride or drive, lead or stand, or permit to stand, any horse or horses, or other animals, on the pathways within the Municipal District; and every person so offending shall for such offence forfeit and pay a fine or sum not exceeding one pound nor less than five shillings in excess of any damages done.

Licensing timber carriages.

54. No timber carriage or vehicle used for that purpose, or dray attached as a substitute for the conveyance of timber or other material will be allowed to ply or work within or through the Municipal District unless the same be licensed. This clause only to apply to timber carriages and other vehicles attached as aforesaid working for hire or drawing timber to railway station or for shipment. The owners of any such timber carriage as aforesaid shall have their names painted in legible letters with the word "Licensed," on some conspicuous part of such timber carriage respectively. The license fee shall be at the rate of ten shillings per wheel per annum, and all such licenses shall be issued for a period of twelve months, terminable on the 30th June in each year. And every owner who shall omit or fail to comply with the provisions of this By-law shall forfeit a sum not exceeding five pounds nor less than two pounds.

Placing goods, carriages, &c., on the footways.—Not removing the same when required.—Replacing same after removal.—Awnings to be excepted

55. Any person who shall set or place, or cause or permit to be set or placed, any stall, board, chopping block, show board (on hinges or otherwise), basket, wares, merchandise, casks, or goods of any kind whatsoever, or shall hoop, place, wash, or cleanse, or shall cause to be hooped, placed, washed, or cleansed, any pipe, barrel, cask, or vessel in or upon or over any carriage or foot way in any street or public place within the said Municipality, or shall set out, lay, or place, or shall cause or procure, permit, or suffer to be set out, laid, or placed, any coach, cart, wain, waggon, dray, wheelbarrow, handbarrow, sledge, truck, or other carriage upon any such carriage way, except for the necessary time of loading and unloading such cart, wain, waggon, dray, sledge, truck, or other carriage, or taking up or setting down any fare, or waiting for passengers when actually hired, or harnessing or unharnessing the horses or other animals from such coach, cart, wain, waggon, dray, sledge, truck, or other carriage; or if any person who shall set or place or cause to be set or placed in or upon or over any such carriage or foot way, any timber, stone, bricks, lime, or other material or things for building whatsoever (unless the same shall be enclosed as herein directed), or any other matters or things whatsoever; or shall hang out or expose, or shall cause or permit to be hung out or exposed, any meat or offal or other thing or matter whatsoever from any house or other buildings or premises, or any other matter or thing from and on the outside of the front or any other part of any house or other buildings or premises over or next unto any such street or public place, and shall not immediately remove all or any such matters or things, being thereto required by the Inspector of Nuisances or other proper officer of the Council, shall upon conviction for every such offence forfeit and pay for the first offence a sum not exceeding forty shillings nor less than five shillings, for the second offence a sum not exceeding five pounds nor less than ten shillings, and for a third and every subsequent offence a sum not exceeding ten pounds nor less than one pound: Provided that nothing herein contained shall be deemed to prevent any person from placing an awning in front of his or her shop or house in such manner as that such awning shall be at least seven feet high above the height of the footway, and that the posts be placed close to the kerbstone or outer edge of such foot way, and a plan of such awning submitted to the Council prior to its erection and approval of by said Council or any officer duly appointed for the purpose.

Riding on drays, careless driving, &c.

56. If the driver of any waggon, wain, cart, or dray of any kind shall ride upon any such carriage in any street as aforesaid, not having some person on foot to guide the same (such carts as are drawn by one horse or driver or guider with reins only excepted); or if the driver of any carriage whatsoever shall wilfully be at such a distance from such carriage, or in such a situation whilst it shall be passing upon such street that he cannot have the directions and government of the horse or horses or cattle drawing the same, or if the driver of any waggon, cart, dray, or coach or other carriage whatsoever meeting any other carriage shall not keep his waggon, cart, dray, or coach, or other carriage on the left or near side of the road, street, or thoroughfare; or if any person shall in any manner wilfully prevent any other person or persons from passing him or her or any carriage under his or her care upon such street, or by negligence or misbehaviour prevent, hinder, or interrupt the free passage of any carriage or person in or upon the same, every driver or person so offending shall upon conviction forfeit and pay any sum not exceeding forty shillings.

Nuisance.

Dead animals, &c. not to be thrown into any public watercourse, &c.

57. Any person who shall cast any filth, rubbish, or any dead animal, or any animal with intent of drowning, into any public watercourse, sewer, waterhole, road, or pathway, or who shall suffer slops, suds, or filth of any kind to flow from his or her premises into any such watercourse, waterhole, or who shall permit, or suffer any such slops, suds, or filth to flow from his or her premises over any of the foot-ways or streets of the Municipality, or shall permit, or cause by means of pipes, shoots, channels, or other contrivances, filth of any kind whatsoever to flow into any public watercourse, waterhole, or shall obstruct or divert from its channel any sewer or watercourse, shall forfeit any sum not exceeding five pounds nor less than ten shillings.

Dead animals—mode of removal.

58. If any animal shall die in any part of the said Municipality, and the owner of such animal, or the occupier of the place, if private property, where such animal shall have died shall not cause such animal to be immediately removed and destroyed by fire, or so effectually disposed of that no nuisance can possibly result therefrom in any part of the Municipality, he shall for every such offence forfeit and pay any sum not exceeding twenty pounds nor less than one pound.

Power of Inspector as to dead animals on private premises.

59. The Inspector of Nuisances, or any officer appointed by the Council of the said Municipality, with his assistant, may, at any hour, enter upon any premises or place within the said Municipality where any animal has died, and require the owner or occupier of such premises or place immediately to destroy such animal by fire, and if necessary to remove the same for that purpose as such Inspector of Nuisances or other officer

appointed by the said Council shall direct, or otherwise forthwith effectually to remove and dispose of the same as aforesaid in default of which it shall be lawful for any one or more of such officers to cause such animal to be removed for that purpose, and every owner or occupier of such premises or place failing, neglecting, or refusing to comply with such requisition shall forfeit and pay any sum not exceeding twenty pounds nor less than one pound.

Dead animals in certain cases to be removed at cost of Municipality.

60. If any animal shall die in any public place or street within the said Municipality, and the owner or any person having charge of such animal cannot at the time be found or ascertained, it shall be immediately removed by the Inspector of Nuisances, or other officer appointed by the said Council, and destroyed in manner aforesaid at the cost of the Municipality.

Drains.

61. All drains whatsoever, and the water-closets, earth-closets, privies, cesspools, and ashpits within the Municipality of Taree shall be constructed so as not to be a nuisance or injurious to health, and so that there shall be no overflow, soakage, leakage therefrom.

Cleansing of privies and cesspits.

62. The occupier of any house, building, or tenement within the Municipality of Taree shall cause every privy, cesspool thereon to be emptied and cleaned from time to time as soon as any portion of the contents of such cesspool shall have so accumulated therein as to be within a distance of one foot from the top of the wall, sides, or lining of such cesspool: Provided that the contents of any privy shall not be removed or discharged therefrom except between the hours of eleven p.m. and five a.m.; and provided also that the contents of any privy or cesspool shall not be removed or discharged therefrom until such contents shall have had mixed therewith a quantity of chloride of lime, zinc, carbolic acid, or some other efficient deodorizer sufficient to effectually deodorize and disinfect the same.

Objectionable closets to be altered.

63. If any alteration shall be required, in the opinion of the Inspector of Nuisances or any officer of the Council appointed in that behalf, for preserving public health or decency in the case of any existing cesspit or closet, the Inspector of Nuisances or other officer of the Council shall report the same to the Council, and if the Council shall adjudge such cesspit or closet to be injurious to health or opposed to decency the same shall be altered by the occupier or owner of the premises upon which such cesspit or closet exists, after due notice has been served upon such occupier or owner; and should such occupier or owner neglect or refuse to alter the same, the Inspector of Nuisances or other officer appointed by the Council shall forthwith make the necessary alterations, and the costs of the same shall be paid by the owner or occupier of the premises wherein the same shall be.

Earth-closets.

64. That after 31st of March, 1886, where it is considered by this Council, on report from the Inspector of Nuisances, that any water-closet or cesspit within the Municipal District is offensive or injurious to public health, such water-closet or cesspit shall be converted into an earth-closet, according to plans to be provided by this Council: Provided that no person shall be permitted to cover up, or cause to be covered up, any existing closet or cesspit with earth or other material unless and until the same shall be properly emptied. Any owner or occupier upon whose premises such water-closet or cesspit exists who shall fail after fourteen days shall upon conviction be liable to a fine not exceeding five pounds nor less than one pound.

The disposition of night-soil.

65. The place of deposit of night-soil shall be in such locality as may from time to time be determined by the Council, and until otherwise provided by the Council shall be disposed of as authorized by the Inspector of Nuisances.

Prohibition of use of night-soil.

66. No person shall be at liberty, without the permission of the Council, or of the Inspector of Nuisances, or other officer of the Council appointed in that behalf, to use on his own premises any night-soil. And any person committing a breach of this by-law shall be liable to a penalty of not less than two pounds nor more than ten pounds.

Cost of emptying cesspits, &c.

67. The Council may, after due application, recover such sums for the emptying of cesspits or attendance on earth-closets at such rates as may from time to time be decided upon and fixed by the Council to be charged in respect of such services.

Inspector of Nuisances' report.

68. It shall be the duty of the Inspector of Nuisances to furnish the Council with a report every month, containing a list of persons proceeded against for nuisances within this Municipality, specifying the dates and giving particulars of each case.

Maximum and minimum penalties where not otherwise provided for.

69. In any case where no special penalty is fixed in these By-laws for any breach of the same, the maximum penalty for any such breach shall be twenty pounds and the minimum one pound.

Cleansing butchers' shambles, &c.

70. For preserving the cleanliness of the said Municipality and the health of the inhabitants thereof, it shall be lawful for the Inspector of Nuisances, or for any other officer or officers appointed by the Council from time to time, and when and as often as he or either of them shall see occasion, to visit and inspect the butchers' shambles, slaughter-houses, boiling-down establishments, tanneries, fellmongering establishments, and soap-works in the said Municipality, and to give such directions concerning the cleansing the said shambles, slaughter-houses, tanneries, soap-works, and establishments, both within and without, as to him shall seem needful; and any butcher or the owner or occupier of any such shamble, slaughter-house, tannery, soap-works, or establishments who shall refuse or neglect to comply with such directions within a reasonable time shall forfeit and pay a sum not exceeding ten pounds nor less than ten shillings.

Complaints respecting dirty premises, &c.

71. Upon the complaint of any householder that the house, premises, yards, closets, or drains of the neighbouring or adjoining premises are a nuisance or offensive, the Inspector of Nuisances or any officer appointed by the said Council shall make an inspection of the premises complained of, and the officer of the said Council shall have the full power without any other authority than this By-law to go upon such premises for the aforesaid purpose; and any person who shall personally or by any person in his employment or under his control suffer any waste or stagnant water, or any muck, filth, soil, or other offensive matter in any cellar or place within any dwelling-house or premises within the said Municipality, or shall in like manner suffer the contents of any water-closets, privy, or cesspool to overflow or soak therefrom shall for every such offence forfeit and pay a sum not exceeding five pounds nor less than one pound.

Premises in such state to endanger public health.—House to be purified on certificate of one medical practitioner.

72. If upon the certificate of any one duly qualified medical practitioner it appear to the Council that any house or part thereof, or the premises occupied in connection therewith, within the limits of the said Municipality, is in such a filthy state or unwholesome condition that the health of any person is or may be liable to be affected or endangered thereby, and that the whitewashing, cleansing, or purifying of any house or part thereof, or the premises occupied in connection therewith, would tend to prevent or check infectious or contagious disease, the said Council shall give notice in writing to the owner or occupier of such house or part thereof, or the premises occupied in connection therewith, to whitewash, cleanse, or purify the same as the case may require; and if the person to whom the notice is so given shall fail to comply therewith within such time as shall be specified in the said notice, he shall be liable to a penalty not exceeding ten shillings for every day during which he continues to make default, provided that no such penalties shall collectively amount to any greater sum than twenty pounds.

Various obstructions and annoyances.

73. Every person who, in any street or other public place or passage within the said Municipality, to the obstruction, annoyance, or danger of the residents or passengers, shall commit any of the following offences shall on conviction for any and every such offence forfeit and pay a penalty of not more than two pounds:—

1. Every person who shall hoist or cause to be hoisted, or lower or cause to be lowered, goods of any description from any opening in any house fronting any street or public place, and close to the footway thereof, without sufficient and proper ropes and tackling.
2. Every person who shall carry or convey, or cause to be carried or conveyed, in any street or public place, the carcase or any part of the carcase of any newly-slaughtered animal without a sufficient and proper cloth covering the same for the concealment from public view, or shall hawk or carry about butchers' meat for sale without covering the same as aforesaid.
3. Every person who shall place any line, cord, or pol across any street, lane, or passage, or hang or place clothes thereon, or allow any tree or shrub overhanging the footpath, to the danger or annoyance of any person.
4. Every person who shall place any flower-pot in any upper window near to any street or public place without sufficiently guarding the same from being thrown down.

5. Every person who shall throw or cast from the roof or any part of any house or other building any slate, brick, part of a brick, wood, rubbish, or other material or thing (unless within a board enclosure) when any house or building is being erected, pulled down, or repaired.
6. Every person who shall, within the distance of twenty yards from any dwelling-house, burn any rags, bones, cork, or other offensive substance to the annoyance of any inhabitant.
7. Every person who shall be the keeper of or have any dog or other animal which shall attack or endanger the life or limb of any person who may have the right of way or use of any private yard, alley, street, or any other place within the said Municipality.

Persons not to stand or loiter in streets.

74. Any person or persons standing or loitering upon any of the footways or other public place in this Municipality, to the inconvenience or annoyance of the inhabitants or passers-by, or in any way interrupting the traffic, and shall not discontinue to do so on being requested by any officer or servant of the Municipal Council of this Municipality, or any Police Officer, shall upon conviction forfeit and pay a penalty not exceeding two pounds nor less than ten shillings.

Swine not to wander about the streets.

75. Any person who shall breed, feed, or keep any kind of swine in any house, yard, or enclosure situate and being in or within sixty feet of any street in the Municipality, or shall suffer any kind of swine, or any horse, ass, cattle, mule, sheep, goat, or any other animal of the like nature belonging to him or her, or under his or her charge, to stray or go about, or to be tethered or depastured in any street, road, or public place within the said Municipality, shall forfeit and pay for every such offence a sum not exceeding forty shillings, and to be made liable for damages.

No rock, &c. to be blasted without notice and permit.

76. Any person who shall be desirous of blasting any rock or other similar substance within one hundred yards of any street or public place or dwelling-house in the said Municipality shall give notice in writing, twenty-four hours previously, to the Town Clerk, who shall appoint a time when the said blasting shall take place; and the said officer shall give such other directions as he may deem necessary for the public safety; and if any person shall blast, or cause to be blasted, any rock within the limits aforesaid without giving such notice, or shall not conform to the directions given to him by the said Town Clerk or other duly appointed officer of the Council, he or she shall on conviction forfeit and pay for every such offence any sum not less than one pound nor more than five pounds.

Bathing prohibited within certain limits.

77. Any person who shall bathe near to or within view of any inhabited house, or of any public wharf, quay, bridge, street, road, or other place of public resort within the limits of the said Municipality, between the hours of six o'clock in the morning and eight in the evening, shall on conviction forfeit and pay a sum not exceeding one pound for every such offence.

Penalty on indecent exposure of the person.

78. Any individual who shall offend against decency by exposure of his or her person in any street or public place within the said Municipality, or in the view thereof, shall on conviction forfeit and pay for every such offence a sum not exceeding ten pounds nor less than one pound.

Houses of ill-fame.

79. Upon representation of any respectable ratepayer that any house or premises within the Municipality, and near to the residence of such ratepayer, is of ill-fame, it shall be lawful for the By-law Committee to cause the residents of such house or premises to furnish to the Council a list of names, ages, sexes, and occupations of all the inmates of the said house or premises; and upon non-compliance with such request, or if, upon consideration, the said Committee consider the house to be one of ill-fame, they shall, with the sanction of the Council, declare the same to be a nuisance, and shall cause a notice in writing to be served upon the holder of such house or premises, or any person resident or being therein, to discontinue or abate the said nuisance within forty-eight hours after the receipt of such notice; and if such nuisance be not so abated the holder of such house or premises, or other person residing or being therein and acting as such holder, shall be liable to be proceeded against for such nuisance, and shall on conviction thereof forfeit and pay any sum not less than two pounds nor more than twenty pounds. And if such nuisance shall not be abated within forty-eight hours after such conviction, such holder of such house, or such other person residing or being therein as aforesaid, shall forfeit and pay for such second offence a sum of not less than five pounds nor more than fifty pounds. And if a further period of forty-eight hours shall elapse after such second conviction without the abatement of such nuisance, such holder of such house, or other person residing or being therein as aforesaid, shall for such third offence forfeit and pay any sum not less than ten pounds nor more than fifty pounds.

No noisome or offensive trades to be carried on to the injury of any inhabitants.

80. No person shall carry on any noisome or offensive trade within the said Municipality, so as to injure or be a nuisance, as hereinafter stated, to the inhabitants thereof.

Definition of noisome and offensive trades.

81. Any manufacture, trades, calling, or operation in the conducting, following, or carrying on of which or in consequence of or in connection therewith, or from the premises where the same is conducted, followed, or carried on, which shall be a nuisance to the inhabitants of the said Municipality shall be considered a noisome and offensive trade within the meaning of these By-laws. And if such trade shall not be discontinued or shall not be so conducted as that it shall wholly cease to be noisome and offensive as aforesaid within twenty days after notice, any person conducting, following, or carrying on such trade as aforesaid shall for the first offence forfeit and pay a sum not less than forty shillings nor more than five pounds, for a second offence a sum of not less than five pounds nor more than twenty pounds, and for the third and every subsequent offence a sum not less than ten pounds nor more than fifty pounds.

Exhibitions, &c., to be licensed.

82. No exhibitions other than exhibitions licensed by the Colonial Secretary, under the provisions of the Act 14 Victoria No. 23 or exhibitions of a temporary character hereinafter specially provided for, shall be held or kept for hire or profit within the said Municipality, nor shall any bowling alley, dancing saloon, or other place of public amusement other than a place licensed as aforesaid or a place for temporary amusement hereinafter specially provided for to be used as such for hire or profit within the said Municipality unless and until the same shall be duly registered as hereinafter prescribed.

Temporary license by Mayor.—Penalty for exhibiting, &c., without license

83. It shall be lawful for the Mayor, by writing under his hand, and without charge, to permit any such exhibition as aforesaid (other than an exhibition requiring to be licensed by the Colonial Secretary under the said Act), and which shall not be held or kept for more than one week, and in like manner to allow any place within the said Municipality to be used for purposes of public amusement other than entertainments requiring to be licensed as aforesaid for not more than one week: Provided that it shall be incumbent upon such Mayor to inquire strictly as to the nature of such proposed exhibition or amusement before granting such permission, and to refuse such permission if it shall appear that such proposed exhibition or amusement is of such a nature as to require to be licensed by the Colonial Secretary as aforesaid, or if there shall be reasonable cause for believing that such exhibition or amusement will be likely to entail any violation of public decency, to endanger the public peace, or to be a nuisance to any inhabitant of the Municipality. Every person holding or keeping any such exhibition, or using any place within the said Municipality for public amusement as aforesaid, or causing or permitting any place to be so used, without such permission of such Mayor, shall forfeit and pay a sum not less than five shillings or more than forty shillings for every day that such exhibition shall be so held or kept or such place shall be so used for public amusement as aforesaid.

Registration fee—Time for which registration shall be in force.

84. For every such registration as aforesaid the occupier of the building or land so registered shall pay to the Council Clerk, for the benefit of the said Municipality, a fee of one pound; and every such registration, whenever the same may be made, shall be in force until the thirty-first day of December then next ensuing and no longer.

No exhibition, &c., on Sundays, &c.

85. No such exhibition or place of public amusement as aforesaid shall be held or kept open or used for the purposes of such public amusement on Sundays, Christmas Day, or Good Friday; and every person offending against this By-law in this behalf shall on conviction forfeit and pay a sum not exceeding five pounds nor less than two pounds for every such offence.

Unlawful games and exhibitions.

86. No license shall be granted as aforesaid to or for any building or land wherein or whereon any games with dice, or other games of chance for money, or any bull-baiting, dog-fighting, cock-fighting, or other exhibitions or amusements opposed to public morality or involving cruelty to animals or likely to cause any breach of the peace are proposed to be had or carried on; and the occupier of any building or land so registered as aforesaid who shall permit any such game of chance or exhibition or amusement as are in the section before mentioned to be had, held, or carried on, in, or upon such building shall for every such offence forfeit and pay a sum of nor less than ten shillings nor more than ten pounds.

Wilful trespass.

87. Every person who shall wilfully let in or knowingly suffer to enter upon the reserves or public recreation ground any animals without due authority shall be deemed guilty of wilful trespass, and shall be liable for every such offence to a penalty not exceeding twenty pounds nor less than two pounds.

Penalty for destroying boundary marks.

88. Any person pulling down, defacing, or injuring any marks or any fence or other erection without the authority of the Council shall forfeit and pay any sum not exceeding ten pounds nor less than one pound.

Public and private property.—Erection of houses, &c.

89. No person shall be permitted to erect any house, shop, or other building, in any street, lane, or place in the Municipality without first serving notice in writing on the Mayor or Council Clerk, on any lawful day between the hours of eight o'clock a.m. and eight o'clock p.m., stating such intention and describing the proposed situation of the building or erection, and without having received an authority from the Mayor or Council Clerk, who will give the required level and alignment if in a proclaimed street, on a payment of a fee of five shillings. No person shall be at liberty to encroach beyond the building line in any street or lane by the erection of houses, verandahs, doorsteps, fences, or any other obstruction whatever.

Houses to be spouted.

90. All proprietors of houses within the Municipality having a frontage to any main thoroughfare shall be bound to have the same sufficiently spouted with down pipe, to be carried under the surface of the footpath into the gutter, under a penalty of ten shillings on conviction; and if not remedied at the expiration of seven days after such conviction, the offender shall be again liable to a like conviction and penalty, also for every succeeding seven days.

Using bark for building in the main thoroughfare.

91. No person shall erect any building of bark, nor roofed with that material, or with calico, within the populous part of the town, except by express permission of the Council, and then for a temporary purpose only. Any person so offending shall on conviction be liable to a penalty not exceeding ten pounds, to be recovered in a summary way, and shall be bound to remove the aforesaid building within such period as the Council may determine.

Injuring or extinguishing lamps.

92. Any person who shall wantonly or maliciously break or injure any lamp or lamp-post, or extinguish any lamp set up for public convenience in the said Municipality, shall, over and above the necessary expense of repairing the injury committed, forfeit and pay for every such offence any sum not less than one pound nor more than five pounds.

As to damaging buildings.

93. Any person who shall damage any public building, wall, parapet, fence, sluice, bridge, culvert, sewer, watercourse, tree-guard, or other public property within the said Municipality, shall pay the costs of repairing the same; and if such damage be wilfully done, shall forfeit and pay a sum not exceeding five pounds nor less than one pound.

Affixing placards on walls, &c.

94. If any person or persons shall paste, or cause to be pasted, or otherwise affix any placard or other paper, or chalk or paint upon any wall, fence, culvert, kerbstone, pathway, hand-rail, or any other property of the Council, shall forfeit and pay for every such separate offence a sum not exceeding five pounds nor less than one pound.

Damaging trees.

95. Any person who shall wilfully and without the authority of the Council cut, break, bark, root up, or otherwise destroy or damage the whole or any part of any tree, sapling, shrub, or underwood growing in or upon any street or place under the management of the Council shall forfeit any sum not exceeding ten pounds nor less than one pound.

Obstructing public pathways.

96. That the owner or occupier of any land situate on the side of any street or road in this Municipality who shall permit any tree, shrub, or plant kept for ornaments or otherwise, to overhang any path or footway on the side of any such street or road so as to obstruct the passage thereof, and who, on demand made by the Council or their overseer or inspector, shall not cut, or cause to be cut, lopped, or to be lopped, all such trees, shrubs, or plants to the height of eight feet at least, the said Council and their servants, labourers, and workmen may cut, or cause to be cut, or lopped, all such overhanging trees, plants, and shrubs, and to remove or burn any portion of such trees, plants, or shrubs so cut or lopped without being deemed a trespasser or trespassers; and in case any person or persons shall resist or in any manner forcibly oppose the said Council or their servants, labourers, or workmen in the due execution of the powers given in this behalf by virtue of the "Municipalities Act of 1867," every person so offending shall on conviction for every such offence forfeit and pay any sum not exceeding ten pounds.

Neglecting to keep clean private avenues.

97. Any owner or occupier of any house or place within the said Municipality who shall neglect to keep clean all private avenues, passages, yards, and ways within the said premises, so as by such neglect to cause a nuisance by offensive smell or otherwise, shall on conviction forfeit and pay a sum not exceeding forty shillings nor less than ten shillings for every such offence.

Legal proceedings against offenders.

98. The Inspector of Nuisances or other person appointed by the Council may take legal proceedings against any person or persons committing any offence or offences against any of the By-laws of the said Municipality.

SCHEDULE A.

I, , Mayor of the Municipality of Taree, do hereby authorize you, , the Bailiff of the said Municipality, to distrain the goods and chattels in the dwelling-house (or in and upon the land and premises) of , situate at street, for , being the amount of rates due to the said Municipality to the day of for the said premises, and to proceed thereon for the recovery of the said rates according to law.

Dated this day of , 188 .

Mayor.

SCHEDULE B.

	£.	d.
1. For making entry into or upon the premises in executing a warrant with or without inventory...	2	6
2. If more than one hour in possession	2	6
3. For every day or part of a day in possession.....	2	6
4. Five per cent. on the net proceeds of any sale.		

SCHEDULE C.

I have this day, in virtue of the warrant under the hand of the Mayor of the Municipality of Taree, dated distrained the following goods and chattels in the dwelling-house (or in and upon the land and premises) of situated at , within the said Municipality, for , being the amount of rates due to the said Municipality to the day of 188 .

Bailiff.

The foregoing By-laws were made and passed at a meeting of the Municipal Council of Taree, held this twelfth day of November, 1885.

(L.S.) HENRY W. FLETT,
Mayor.

HORACE BEETON,
Council Clerk.

Sydney: Thomas Richards, Government Printer.—1886.

[6d.]

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(COBAR FREE PUBLIC LIBRARY—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 153.

Department of Public Instruction,
Sydney, 30th October, 1885.

MUNICIPALITY OF COBAR.

THE following By-laws for the regulation of the Cobar Free Public Library, which have been made by the Municipal Council of Cobar, and confirmed by His Excellency the Governor in Council, are published in accordance with the requirements of the Municipalities Act of 1867.

W. J. TRICKETT.

BY-LAWS made and passed by the Municipal Council of Cobar, for regulating and managing the Free Public Library now established by this Council:—

1. The Library shall be open to the public on every lawful day during four hours at least.

2. Every person who shall enter the Library shall write his or her name in a book to be kept for that purpose, and to be called the "Visitors' Book," and no person who shall refuse to comply with this regulation shall be permitted to enter or remain in such Library.

3. Every person who shall, being intoxicated, enter or remain in the Library, or who shall use therein any abusive or improper language, or who shall by unnecessary loud talking, or any unnecessary noise, or otherwise disturb or annoy the persons using or being within the Library shall on conviction before any Bench of Magistrates, pay a fine of not less than ten shillings.

4. No person shall remove any book or other publication from the said Library.

5. Any person who shall wilfully damage any book or other publication shall for every such offence forfeit and pay any sum not exceeding five pounds.

6. A record shall be made of every donation to this Library, and the book containing the same shall be open to the inspection of all persons visiting this Library.

The foregoing By-laws were made and passed at a meeting of the Municipal Council of Cobar, held this fourth day of September, 1885.

(L.S.) ANTHONY BROUGH,
Mayor.

Witness—

THOMAS BLAKEY,
Council Clerk.

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES.

(COOTAMUNDRA FREE PUBLIC LIBRARY—BY-LAWS)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 153.

Department of Public Instruction,
Sydney, 22nd October, 1885.

THE following By-laws for the regulation of the Cootamundra Free Public Library, which have been made by the Municipal Council of Cootamundra, and confirmed by His Excellency the Governor in Council, are published in accordance with the Municipalities Act of 1867.

W. J. TRICKETT.

BY-LAWS for the regulation of the Free Public Library, Cootamundra.

1. The Library shall be open every Monday, Thursday, Friday, and Saturday, from 7 p.m. to 8.30 p.m., and every Tuesday and Wednesday from 10 a.m. to 12 noon, except public holidays.

2. Every person who shall enter the Library shall, immediately on entering the same, write his or her name and address in a book to be kept for such purpose at such Library, and to be called the "Visitors' Book;" and if such person shall be unable to write, then such name and address may be so written by any other person, or shall be so written by the proper officer of the Council at such Library, at the request of such person; and no person who shall refuse to comply with this regulation shall be permitted to remain in such Library, and it shall be the duty of the officer of such Library to enforce this by-law.

3. Any person who, being intoxicated, shall enter such Library shall be at once removed from the premises; any person who shall use therein any abusive, improper, or unbecoming language, or who shall, by unnecessarily loud talking, or by any noise, or otherwise, disturb or annoy the persons using or resorting to such Library, or who shall without lawful excuse, but without felonious or larcenous intent, remove any property from such Library, shall forfeit and pay any sum not less than ten shillings nor more than ten pounds; and any such person may be forthwith removed by any officer of the Council in charge of such Library.

4. Any society or class for mutual improvement or instruction or for study or experiments may, with the consent of the Council, be formed in connection with, or may hold its meetings, or carry on its studies or experiments at, the said Library, provided that the general free access to and the use of the said Library by persons who are not members of such society or class be not thereby interfered with; provided however, that no rule made by the members of any such society or class for the management of the same shall conflict in any way with these Regulations made by the said Council hereunder.

5. Any person who shall wilfully damage any visitors book, catalogue, copy of regulations, or other book or record kept at the Library for the general use thereof, shall for every such offence forfeit and pay any sum not less than ten shillings nor more than ten pounds.

6. It shall be the duty of the Librarian to report at every meeting of the Library Committee any infraction of the rules or any injury to the books.

7. The foregoing rules shall be printed, framed, and suspended in the Library room for the information of visitors.

8. Any ratepayer may propose books for addition to the Library, on entering the titles, price, and other particulars in a book to be kept for that purpose.

9. The Library shall be closed annually from 1st to 15th November inclusive.

10. Newspapers shall not be detained more than a quarter of an hour nor periodicals more than half an hour, if required by another visitor, he having intimated his wish to the person reading the same.

Passed by the Municipal Council of the Borough of Cootamundra, on the 6th day of August, A.D. 1885.

(L.S.) THOMAS M'BEATH,
Mayor.

A. J. M'CARTHY, Council Clerk.

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES ACT OF 1867.

(BY-LAWS OF FREE PUBLIC LIBRARY AT PARKES.)

Presented to Parliament pursuant to Act 31 Vic. No. 12, sec. 158.

Department of Public Instruction,
Sydney, 20th May, 1886.

MUNICIPALITY OF PARKES.

THE following By-laws for the regulation of the Parkes Free Public Library, which have been made by the Municipal Council of Parkes and confirmed by His Excellency the Governor in Council, are published in accordance with the requirements of the Municipalities Act of 1867.

ARTHUR RENWICK.

BY-LAWS for the management of the Parkes Free Public Library.

1. The Library shall be open to the public on every lawful day, from 7 p.m. to 10 p.m.

2. Every person who shall enter the Library, shall write his or her name in a book to be kept for that purpose, and to be called the "Visitor's Book," and no person who shall refuse to comply with this regulation shall be permitted to enter or remain in such Library.

3. Every person who shall, being intoxicated, enter or remain in the Library, or who shall use therein any abusive or improper language, or who shall by unnecessary loud talking or any unnecessary noise or otherwise disturb or annoy the persons using or being within the Library, shall on conviction before any Bench of Magistrates pay a fine of not less than ten shillings.

4. No person shall remove any book or other publication from the said Library.

5. Any person who shall wilfully damage any book or other publication, shall for every such offence forfeit and pay any sum not exceeding five pounds.

6. A record shall be made of every donation to the Library, and the book containing the same shall be open to the inspection of all persons visiting the Library.

These By-laws were adopted by the Parkes Municipal Council at their ordinary meeting, held on the 7th December, 1885.

(L.S.) BENJAMIN TALBOT,
Mayor.

H. C. DAVIES,
Council Clerk.

1885-6.

NEW SOUTH WALES.

MUNICIPALITIES ACT OF 1867.

(LISMORE FREE PUBLIC LIBRARY—BY-LAWS.)

Presented to Parliament, pursuant to Act 31 Vic. No. 12, sec. 153.

Department of Public Instruction,
Sydney, 2nd September, 1886.

MUNICIPALITY OF LISMORE.

THE following By-laws for the regulation of the Lismore Free Public Library, which have been made by the Municipal Council of Lismore, and confirmed by His Excellency the Governor in Council, are published in accordance with the requirements of the "Municipalities Act of 1867."

ARTHUR RENWICK.

BY-LAWS FOR REGULATING THE LISMORE FREE PUBLIC LIBRARY.

1. The Library and Reading Room shall be open every Tuesday, Wednesday, Thursday, Friday, and Saturday, from 7 to 10 p.m., and on Saturdays from 2 to 6 p.m. and from 7 to 10 p.m.

2. Every person who shall enter the Library or Reading Room shall, immediately on entering the same, write his or her name and address in a book to be kept for such purpose at such Library or Reading Room, and to be called the Visitors' Book; and if such person shall be unable to write, then such name and address may be written by any other person, or shall be so written by the proper officer of the Council at such Library or Reading Room, at the request of such person, and no person who shall refuse to comply with this regulation shall be permitted to remain in such Library or Reading Room; and it shall be the duty of the officer of such Library or Reading Room to enforce this By-law.

3. Any person who, being intoxicated, shall enter such Library or Reading Room shall be at once removed from the premises. Any person who shall use therein any abusive, improper, or unbecoming language, or who shall by unnecessarily loud talking, or by any noise, or otherwise, disturb or annoy the persons using or resorting to such Library or Reading Room, or who shall without lawful excuse, but without felonious intent, remove any property from such Library or Reading Room shall forfeit and pay any sum not less than ten shillings nor more than ten pounds; and any such person may be forthwith removed by any officer of the Council in charge of such Library and Reading Room.

4. Any society or class for mutual improvement or instruction, or for study or experiments, may, with the consent of the Council, be formed in connection with, or may hold its meetings or carry on its studies or experiments at, the said Library or Reading Room, provided that the general free access to and use of the said Library or Reading Room by persons who are not members of such society or class be not thereby interfered with: Provided, however, that no rule made by the members of any such society or class for the management of the same shall conflict in any way with the Regulations made by the said Council hereinunder.

5. Any person who shall wilfully damage any Visitors' Book, catalogue, copy of Regulations, or other book or record kept at the Library or Reading Room, for the general use thereof, shall for every such offence forfeit and pay any sum not less than ten shillings nor more than ten pounds.

6. It shall be the duty of the Librarian to report at every meeting of the Library Committee any infraction of the rules or any injury to the books.

7. A copy of these By-laws shall be suspended in the Library for the information of visitors.

8. Any ratepayer may propose books for addition to the Library, on entering the titles, price, and other particulars in a book to be kept for that purpose.

9. Any person in a state of intoxication applying for a book shall not be entitled to receive one.

10. All fines, penalties, and forfeitures imposed and recovered as aforesaid shall be paid into the corporate fund of the Municipality.

The foregoing By-laws were finally passed by the Municipal Council of the Municipal District of Lismore, at a meeting held on Monday, the 9th day of August, 1886.

(L.S.) LUDWIK BERNSTEIN,
Mayor.

ST. HELIER PEARD,
Council Clerk.

1885-6.

NEW SOUTH WALES.

NUISANCES PREVENTION ACT, 1875.

(MUNICIPAL DISTRICT OF DUBBO.—AMENDED BY-LAWS.)

Presented to Parliament, pursuant to Act 39 Vic. No. 14, sec. 18.

Colonial Secretary's Office,
Sydney, 30th January, 1886.

MUNICIPAL DISTRICT OF DUBBO—AMENDED BY-LAWS.

THE following Amended By-laws, made by the Council of the Municipal District of Dubbo for carrying into effect the provisions of the "Nuisances Prevention Act, 1875," having been confirmed by His Excellency the Governor with the advice of the Executive Council, are published in accordance with the requirements of the above Act.

JOHN ROBERTSON.

MUNICIPAL DISTRICT OF DUBBO.

BY-LAWS made and passed by the Municipal District Council of Dubbo for carrying out the provisions of the Nuisances Prevention Act, 1875.

1. The existing By-laws of this district made under the provisions of the Nuisances Prevention Act, and published in the supplement to the Government Gazette, number 394, of Tuesday, 3rd October, 1882, are hereby repealed.

2. That the dry earth-closet system be adopted throughout this Municipal District, and in accordance with the following By-laws :—

3. There shall not be formed, dug, or excavated any earth below the surface for the purpose of making any cesspit, cesspool, or other opening for the receptacle of night soil or urine except as hereinafter provided by By-law number 20.

4. All closets made or constructed after these By-laws becoming law shall be made or fitted with a movable receptacle or pan, and such as are usually known as earth closet pans, and as hereinafter described.

5. Every person about to erect a closet shall, before commencing any such work, give to the Town Clerk seven days notice in writing of his intention and of the proposed position of such closet, and in default thereof, or in case of his commencing such work without such notice, he shall be liable to a penalty not exceeding ten pounds.

6. No closet shall be erected or formed except in such position as shall be approved of by the Council or by the Inspector of Nuisances or other officer appointed by the Council.

7. Every closet shall be built with walls seven (7) feet high, and shall be not less than three feet six inches (3ft. 6in.) wide, internal measurement, and not less than four feet six inches (4ft. 6in.) long, internal measurement, shall be ventilated and provided with a door or doors capable of being fastened inside, and shall have a water-tight roof.

8. When two or more closets adjoin, there shall be a dividing wall constructed from floor to roof, so as to effect a complete separation and complete privacy.

9. Every closet shall be provided with a water-tight box made of galvanized iron 26 gauge, having suitable handles, the measurement of which box shall not be less than one cubic foot and shall not exceed two cubic feet.

10. The Council on receipt of any written application, stating special reasons, may permit the use of a larger box.

11. The closet-pan in all cases shall be easy of access and removal from the closet, and stops and guides shall be provided for placing the box in proper position.

12. The occupier of every house, building, or other tenement, or in which the dry-earth closet is adopted, shall at all times cause to be kept in such privy or closet a supply of dry powdered earth, ashes, charcoal, lime, or some other material efficient and sufficient for deodorizing the night-soil deposited therein, and shall cause all such night-soil which may be deposited in any pan or receptacle in such privy or closet to be immediately, on the deposit thereof, covered with a sufficient quantity of dry powdered earth, or such other deodorizing material as aforesaid, and sufficient to thoroughly and effectually deodorize the contents of such pan or receptacle.

13. A separate closet shall be provided for every tenement, and a breach of this By-law shall make the owners or occupiers of any premises, upon which there shall be a joint closet, liable to a penalty not exceeding five pounds.

14. In dwelling-houses where the number of persons who shall ordinarily sleep therein shall exceed twelve, a separate closet shall be provided for every twelve persons or fraction of twelve.

15. In schools, or in factories, or other places of business where a number of persons exceeding twelve shall reside or be occupied or employed, one closet shall be provided for every twenty persons, and separate closets shall be provided for each sex.

16. When any existing closet, cesspit, cesspool, or similar appliance of any kind shall, in the opinion of the Council or their duly appointed officer, be injurious to public health, or be or become a nuisance or opposed to common decency, the owner or owners, or occupiers thereof shall, upon receiving seven (7) days notice from the said Council, or from their duly appointed officer for that purpose, make such alterations as may be ordered by the said Council, or by such officer, within the time prescribed by such notice. In the case of any owner or occupier neglecting or refusing to comply with the terms of such notice, the Council shall and may have the required alterations carried out at the cost and expense of the said owners or occupiers thereof, and in case of neglect or

refusal to pay such expense after demand, the same shall and may be recovered in the manner provided by the Nuisances Prevention Act, 1875.

17. Any person or persons desirous of substituting earth or pan closets for or in lieu of any existing cesspit, cesspool, or privy, shall be at liberty so to do on giving notice to the Council, who may give permission in writing for such substitution, no existing cesspit, cesspool, or other receptacle shall be covered over, filled up, or otherwise abandoned without the consent in writing of the Council.

18. Existing cess-pits shall when abandoned, or when condemned by the Council, on the report of the Inspector of Nuisances, be emptied and cleansed with lime and the pits filled up with dry earth, and the closet converted into dry earth closet, in accordance with these By-laws.

19. No cess-pit, cess-pool, or privy, shall have connected therewith, or attached thereto, any pipe or other appliance capable of being used for the purpose of discharging or removing the contents of such cess-pit, cess-pool, or privy, upon or under the surface of any adjoining ground, or into any drain, or sewer, or into any other place or places whatsoever. Any person or persons wilfully violating this part of the By-laws in any respect shall be liable to and forfeit and pay a penalty of not less than ten shillings nor more than ten pounds.

20. Each hotel, boarding-house, having twelve (12) or more boarders, or school, shall be provided with one or more urinals, constructed as follows :—

The trough of each urinal shall be two (2) feet from the floor at the front or outer edge thereof, and not less than nine inches wide in the clear, six inches deep in the centre, and water-tight; each urinal or compartment thereof shall be not less than two feet six inches long in the clear; the compartments (if any) shall be divided closely from each other above the trough to the height of five feet six inches (5 ft. 6 in.) from the floor; every hotel urinal shall have not less than two (2) such compartments, the backs and ends of each urinal shall be seven (7) feet high, and the ends shall extend three (3) in. beyond the front of the trough; a water-tight pipe shall lead to a galvanised iron vessel for the reception of urine in a pit outside the urinal and screen hereafter provided for; the pit shall be built bottom and sides of brick, floored and lined with cement and covered with a substantial trap-door giving easy access thereto; every pit shall contain a vessel as aforesaid, water-tight, having a suitable handle and made of strong galvanized iron, the measurement of which vessel shall not be less than one cubic foot, and shall not exceed one and a half cubic feet; each urinal shall be provided with a close screen seven (7) feet high placed two (2) feet distant from the front of trough, the back of which screen shall project one (1) foot beyond each end of urinal; two wings seven (7) feet high and two feet six inches (2 ft. 6 in.) long shall be attached to the ends of the back aforesaid, the extreme end of each wing being two feet distant from end of urinal. Provided always, that where a urinal shall be placed at right angles to and against any out building or close fence not less than seven (7) feet high, the back of the screen shall be required to project, and a wing shall be attached at one (1) end only; the back ends, divisions, and trough, shall be constructed either of brick or of galvanized iron; if they are of brick the trough must be lined with cement throughout; the back ends and divisions must be lined with cement to a height of three (3) feet above floor; if they are of galvanized iron they must be so constructed that leakage cannot take place between the trough and back or ends of the urinal; the screen shall be constructed of bricks, of wood, or of iron. Any person or persons who intend to construct any urinal shall give notice in writing to the Council of their intention to do so. The Inspector of Nuisances shall, within forty-eight (48) hours, inspect the premises on which the urinal is intended to be constructed. If it be in accordance with these By-laws and the Nuisances Prevention Act, he shall give the necessary permission for the construction of the urinal, provided that, where practicable, it shall not be situated within twenty-five (25) feet from any dwelling, or fifty (50) feet from any well.

21. The place of deposit for nightsoil, urine, or other fœcal matter, shall be in such locality as may be from time to time determined upon by the Council, and no nightsoil, urine, or other fœcal matter shall be deposited in any other locality except as allowed by By-law No. 22.

22. Every person shall be at liberty, after obtaining the consent of the Council, to use on his own premises all nightsoil, urine, or other fœcal matter collected therefrom; but if any nuisance shall arise therefrom, or if he shall fail to efficiently deodorize the same before using, he shall be liable to a penalty of five pounds, and the permission to use shall be withdrawn.

23. Until otherwise provided by the Council, the contents of all cess-pits, cess-pools, privies, pans, urinals, or other receptacles for nightsoil, urine, or other fœcal matter or waste, shall be removed only by the servants of or contractors with the Council, and in water-tight covered vehicles, between the hours of 11 o'clock p.m. and 5 o'clock a.m.

24. The Council is hereby empowered to enter into any contract or contracts with any person or persons for the due performance of any or all matters concerned or connected with the removal and disposal of nightsoil, urine, or other fœcal matter or waste, and may make regulations from time to time as to them may seem necessary respecting such contract or contracts, and may also, by like regulations, determine the price which the owner or owners or occupants of any premises shall pay or be liable to pay the said Council for emptying and cleansing, or causing to be emptied and cleansed and disposed of, the contents of their cess-pits, cess-pools, privies, pans, or other receptacles for nightsoil, urine, or other fœcal matter or waste as aforesaid; and the said Council may sue for and recover from the owner or occupiers of such premises as aforesaid such charges as may have been fixed by the said Council duly assembled by resolution or otherwise.

25. The Inspector of Nuisances or other officer appointed by the Council may visit and inspect any premises or do any work authorised by these By-laws and the Nuisance Prevention Act, 1875, on all days except Sundays and public holidays between the hours of 10 a.m. and 4 p.m., and 11 p.m. and 5 a.m.

26. Any person allowing nightsoil, urine, or other fœcal matter or waste to fall into any street, right of way, water-channel, gutter, creek, river, or reservoir, or in any public or private place (except as herein provided for) shall forfeit and pay a penalty not exceeding £20 nor less than £2 for every such offence.

27. All earth closets, cess-pits, pans, ash-pits, or receptacles wherein nightsoil, urine, or other fœcal matter or yard sweepings, or house refuse, or waste may be deposited, shall be kept in such a state of cleanliness so as not to be a nuisance, or injurious to health, and no householder, or owner, or resident shall allow or permit any such premises to be a nuisance, or offensive to neighbouring householders or residents under a penalty of not less than one pound for each offence. The owner or occupier of any house, building, passage, yard, cess-pit, or premises within the Municipality shall cause the same and every part thereof to be kept in a cleanly condition, and so as not to be a nuisance or injurious to health.

28. The owner or occupier of any premises within the Municipality, or any other person who shall have or erect upon his premises any closet otherwise than in accordance with these By-laws, or who shall refuse or neglect to comply with the provision of any of the preceding By-laws, or who shall commit any breach thereof, shall in cases where no special penalty is provided forfeit and pay a penalty not exceeding £5, and any person not being duly authorised by the Council who shall remove any nightsoil or empty any cess-pit or earth closet pan, or other receptacle for fœcal matter or house waste, except as provided for by these By-laws, shall be liable to a penalty not exceeding for the first offence £5, and for every subsequent offence £10.

Made and passed by the Municipal Council of Dubbo, this 23rd day of November, in the year of our Lord one thousand eight hundred and eighty-five.

(L.S.) ROBT. BOOTH,
Mayor.

T. W. HEAYDON,
Council Clerk,
Town Hall, 23rd May, 1885.

[3*d*.]

Sydney: Thomas Richards, Government Printer.—1886.

1885-6.

NEW SOUTH WALES.

NUISANCES PREVENTION ACT, 1875.

(BOROUGH OF GRANVILLE—BY-LAWS.)

Presented to Parliament, pursuant to Act 39 Vic. No. 14, sec. 18.

Colonial Secretary's Office,
Sydney, 16th December, 1885.

BOROUGH OF GRANVILLE.—BY-LAWS UNDER "NUISANCES PREVENTION ACT."

THE following By-laws, made by the Council of the Borough of Granville, under the "Nuisances Prevention Act, 1875," having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the above-cited Act.

P. A. JENNINGS.

BY-LAWS made by the Borough Council of Granville, in accordance with the provisions of the "Nuisances Prevention Act, 1875."

1. On and after the 1st day of September, in the year of our Lord one thousand eight hundred and eighty-six, no person or persons shall be permitted to have on their premises any open closet or cesspit for the deposit of fœcal matter; any person or persons allowing any such closet or cesspit to remain after receiving seven days' notice to remove the same shall forfeit a sum not exceeding five pounds nor less than one pound, and after such conviction, if not removed within a further period of seven days, shall forfeit a further sum of not less than five shillings nor more than two pounds for every day that the same shall remain unaltered or unremoved.

2. No person shall be permitted to cover up or cause to be covered up any existing cesspit, with earth or other material, unless and until the same shall be properly emptied by the Council's contractors. Any person offending against this By-law shall be liable to a penalty not exceeding five pounds nor less than one pound.

3. A separate closet shall be provided for every tenement. In schools or factories, where a number of persons shall be employed, separate closets shall be provided for each sex, with a door to fasten on the inside; where two or more closets adjoin each other there shall be a dividing wall between each to effect complete separation; and any person offending against the provisions of this By-law shall incur a penalty not exceeding ten pounds nor less than two pounds.

4. If in the opinion of the Inspector of Nuisances any alteration is required in existing cesspits or closets, he shall report the same to the Council, who shall determine what alteration is necessary for the preservation of health or decency; and such alteration shall forthwith be made by the owner of the premises after receiving seven days' notice to that effect, under a penalty for every week's neglect or delay in effecting such alteration not exceeding five pounds nor less than two pounds.

5. No pan or bucket used as a receptacle in a dry earth closet shall exceed in measurement more than one and a half cubic feet.

6. Any person desirous of having the Council's contractor to attend to their premises for the removal of refuse from a dry earth closet must provide a galvanized iron pan or bucket to hold such refuse, with a handle across the top, and not of a larger capacity than to hold one and a half cubic feet.

7. The night-soil shall be removed by contract in properly constructed water-tight carts between such hours as the Council may determine; and the contractor will be held responsible for the careful conveyance of the night-soil to the appointed depôt, and shall dispose of the same by burying in the earth a sufficient distance and covering with earth so as to prevent any nuisance arising therefrom, under a penalty for neglect not exceeding twenty pounds nor less than five pounds.

8. If the night-soil or any portion thereof shall be sold or given away by the Council, the person removing the same shall do so only at such times and in such manner as the Council may direct, and shall dispose of the same so as not to cause a public nuisance; and the person purchasing or obtaining it shall be held responsible for the same, under a penalty not exceeding ten pounds nor less than two pounds.

9. The Inspector of Nuisances shall have power to visit and inspect any premises on any lawful day between the hours of ten a.m. and four p.m., and any person refusing admittance or obstructing or hindering the officer in the discharge of his duty shall incur a penalty not exceeding five pounds nor less than one pound.

10. The Council shall from time to time fix the charges to be made for emptying and removing night-soil from closets, which shall be emptied as often as may be necessary in the opinion of the Inspector of Nuisances.

11. No closet shall be erected, or commence to be erected, except in such place or position as shall be approved of by the Council or the Inspector of Nuisances, and any person being guilty of a breach of this By-law shall be liable to a penalty of not less than one pound nor more than five pounds.

12. When any new building is about to be constructed the builder or builders thereof shall first erect or cause to be erected on the premises a temporary closet not less than three feet by two feet six inches for the use of workmen employed in the construction of the new building, and any person neglecting to conform to this By-law shall be liable to a penalty not exceeding five pounds nor less than one pound.

13. No person shall be permitted to connect any closet with any drain, water-course, or sewer, without the sanction of the Council; any person so offending shall be liable to a penalty not exceeding twenty pounds nor less than five pounds.

14. Persons requiring their closets emptied shall send written notice to the Council or the Inspector of Nuisances; and any person wishing to use the refuse from dry earth closets shall be at liberty to do so by making proper provision for emptying the same to the satisfaction of the Inspector of Nuisances; and any person causing a nuisance from the careless use of such closet shall be liable to a penalty not exceeding five pounds nor less than one pound.

15. Written notice must be given to the Council or the Inspector of Nuisances by all persons about to construct new or alter existing closets, to enable the Inspector to visit and report on the same, under a penalty for neglect not exceeding five pounds nor less than one pound; and closets constructed without such notice being given must be removed or altered if judged necessary by the Council, under a further penalty not exceeding two pounds nor less than five shillings for each and every day they may remain unremoved or unaltered after due notice to that effect.

16. The maximum penalty for a breach of any of these By-laws shall in each case be ten pounds, and the minimum penalty one pound, unless otherwise provided for.

Made and passed by the Municipal Council of the Borough of Granville, this sixteenth day of September, one thousand eight hundred and eighty-five.

(L.S.) JOHN NOBBS,
Mayor.

JOHN T. BEACH,
Council Clerk.

[3*d*.] Sydney: Thomas Richards, Government Printer —1886

1885-6.

NEW SOUTH WALES.

NUISANCES PREVENTION ACT, 1875.

(BOROUGH OF YOUNG—BY-LAWS.)

Presented to Parliament, pursuant to Act 39 Vic. No. 14, sec. 18.

Colonial Secretary's Office,
Sydney, 9th February, 1886.

BOROUGH OF YOUNG.—BY-LAWS.

THE following By-laws, made by the Council of the Borough of Young, under the "Nuisances Prevention Act 1875," having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the above-cited Act.

JOHN ROBERTSON.

BOROUGH OF YOUNG.—BY-LAWS UNDER THE NUISANCES PREVENTION ACT, 1875.

1. That the dry-earth closet system be adopted in the town proper of the Borough of Young.

2. That from and after the 3rd day of September, A.D. 1885, no person or persons shall be permitted to excavate, erect, or build any cesspool or cesspit for the purpose of being used for closets or privies within the boundaries of the town of Young. And all closets or privies from and after the said date shall be constructed and made on the dry-earth system.

3. Every closet shall be built in such a position that the same may be emptied without the contents being carried through any dwelling house, and any person having or building a closet contrary to this By-law shall be liable to a penalty of not less than £2, and not more than £10.

4. If any alteration shall be requisite in the opinion of the Inspector of Nuisances, or any other officer appointed by the Council in that behalf, for preserving public health or decency in case of any existing cesspit or closet, and such Council shall adjudge such cesspit or closet to be injurious to the health or opposed to decency by exposure or otherwise, and the owner or occupier shall not make the necessary alterations after receiving 14 days' notice so to do from the Council Clerk, it shall be lawful for the Inspector of Nuisances, or other officer appointed by the Council, to make the necessary alterations, and the costs of such alterations shall be paid by the owners or occupiers of the premises whereon the same shall be.

5. Until otherwise provided by the Council all nightsoil shall be removed from cesspits by contract, in water-tight covered vehicles, between the hours of 11 o'clock in the evening and 5 o'clock in the morning; and if any person shall remove from any cesspit any nightsoil in any other manner or at any other time than as provided by this By-law he shall forfeit and pay a penalty of not less than £1, nor more than £5.

6. Any person desirous of erecting an earth closet must deliver to the Council Clerk seven days previous notice in writing of his intention so to do.

7. The Inspector of Nuisances or other officer appointed by the Council may visit and inspect any premises or do any work authorised by the Nuisances Prevention Act, 1875 therein, on all days except Sundays and holidays, and any person who shall hinder or obstruct any Inspector of Nuisances or other officer as aforesaid, upon any such visitation or inspection, or in the doing or performing of any work, shall forfeit and pay a penalty of not less than ten shillings nor more than forty shillings.

8. The Inspector of Nuisances shall furnish the Council with a monthly return, showing the number of cesspits emptied and earth closets attended to, the amount due and payable for each cesspit and earth closet attended upon, and the amount of arrears due for emptying cesspits and attending on earth closets. He shall collect the amounts so due and payable and account therefor to the Council at the least once in every month, or as may be determined upon by such Council.

9. Any person or persons requiring their cesspits emptied shall send written notice to the Council or the Inspector of Nuisances. And any person or persons emptying or causing to be emptied any closet without the sanction of the Council or Inspector of Nuisances shall be liable to a penalty not exceeding £10 nor less than £1.

10. The Council may charge such sum for the emptying of cesspits or attendance upon earth closets, as may be decided upon from time to time by resolution of the Council, and the Council or the Inspector of Nuisances on their behalf may at any time after seven days previous notice of their or his intention so to do shall have been left upon the premises, in respect of which such sums are payable, sue for and recover the same.

11. Every earth closet hereafter to be built shall be provided with a galvanised iron pail of the following dimensions, namely, fifteen inches in diameter and sixteen inches in depth, such pails to be provided by the Council and sold at cost price.

12. Every earth closet, whether already built or hereafter to be built, shall be provided with a box or earth compartment, such box or earth compartment to be without lid, and provided with a pint scoop for each occupant to throw in a pint of the stored dry earth or dry ashes through the seat into the galvanised iron pail.

13. The Inspector of Nuisances shall not take any legal proceedings under these By-laws without informing the Mayor of his intention so to do.

Passed by the Council of the Borough of Young, on Thursday, 3rd September, 1885.

(L.S.) WILLIAM SHARP,
Mayor.

A. W. HONOTR, Town Clerk.

1885-6.

NEW SOUTH WALES.

NUISANCES PREVENTION ACT, 1875.

(BOROUGH OF WAGGA WAGGA—BY-LAWS.)

Presented to Parliament, pursuant to Act 39 Vic. No. 14, sec. 18.

Colonial Secretary's Office,
Sydney, 25th February, 1886.

BOROUGH OF WAGGA WAGGA.—BY-LAWS.

THE following By-laws, made by the Council of the Borough of Wagga Wagga, for carrying out the provisions of the "Nuisances Prevention Act, 1875," having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the above-cited Act.

JOHN ROBERTSON.

THE NUISANCES PREVENTION ACT.

THE following By-laws have been made by the Borough Council of Wagga Wagga for carrying out the provisions of "The Nuisances Prevention Act, 1875" :—

1. Every person about to erect a closet or form an earth-closet shall, before he shall commence any such work, give to the Town Clerk seven days' notice in writing of his intention, and of the proposed position of such earth-closet; and in default thereof, or in case of his commencing such work without such notice, he shall be liable to a penalty not exceeding £10.

2. No closet shall be erected or earth-closet formed except in such position as shall be approved of by the Council or by the Inspector of Nuisances or other officer appointed by the Council.

3. Every closet shall be built with walls 7 feet high, and shall not be less than 3 feet 6 inches wide, and 4 feet 6 inches long, and shall be provided with a door capable of being fastened from the inside, and shall have ventilating holes 4½ inches wide.

4. When two or more closets adjoin each other, there shall be a brick or stone dividing wall of not less than 9 inches in thickness between every two closets; and such wall shall extend from the bottom of the earth-closet through the roof of the closet, so as to effect a complete separation.

5. A separate closet shall be provided for every tenement, and a breach of this By-law shall make the owner or occupier of any premises upon which there shall be a joint closet liable to a penalty not exceeding £5.

6. In dwelling-houses where the number of persons who shall ordinarily sleep therein shall exceed twelve, the capacity of the earth-closet shall be increased by 4 cubic feet for every person beyond the number of twelve, or else a separate closet shall be provided for every twelve persons or fraction of twelve.

7. In schools or factories or other places of business where a number of persons exceeding twelve shall reside or be occupied or employed, one closet shall be provided for every twenty persons, with a pan of a capacity of not less than four pans, and separate closets shall be provided for each sex.

8. If any alteration shall be requisite, in the opinion of the Inspector of Nuisances or any other officer appointed by the Council in that behalf, for preserving public health or decency, in the case of any existing earth-closet, the owner or occupier of such premises shall receive fourteen days' notice to remove or alter the same; and if he fail to do so, the Inspector or other officer shall report the same to the Council, and if the Council shall adjudge such earth-closet or closet to be injurious to the health or opposed to decency by exposure or otherwise, the same shall be altered by such Inspector of Nuisances or other officer, and the cost of such alteration shall be paid by the owner or occupier of the premises wherein the same shall be situated.

9. The place of deposit for night-soil shall be in such locality as may from time to time be determined upon by the Council; and no night-soil shall be deposited in any other locality within the Municipality, except as allowed by By-law 16 hereinafter following.

10. Until otherwise provided by the Council, all night-soil shall be removed from earth-closets in water-tight covered vehicles, between the hours of eleven o'clock in the evening and five in the morning; such vehicles to be subject to inspection by the Council or officer appointed by them, and to be subject to a license fee of £1 per annum, payable on the first of January in each year.

11. Until and unless otherwise provided by the Council, all night-soil shall be disposed of by burying it in the earth 2 feet deep.

12. In case the Council shall sell or give away any night-soil, the same shall be removed in the same manner as above provided, and on being removed from the vehicles in which it is carried it shall be deodorized by chemicals or in some other manners or covered with earth, so as to prevent any offensive smell arising therefrom.

13. The Inspector of Nuisances or other officer appointed by the Council may visit and inspect any premises, or do any work authorized by the Nuisances Prevention Act, 1875, on all day, except Sundays and public holidays, between the hours of ten o'clock in the morning and four in the afternoon.

14. Any person desirous of erecting an earth-closet shall be at liberty to do so after giving notice of his intention to do so to the Inspector of Nuisances or other officer appointed by the Council; but all night-soil shall be removed therefrom once in four days, or oftener, and shall be buried in the earth 2 feet deep; and this By-law shall apply to earth-closets already in use, as far as practicable.

15. The contents of cesspools, cesspits, privies, earth-closets, or other receptacles for night-soil shall be removed by contract in properly constructed water-tight carts; and the said Council is hereby empowered to enter into any contract or contracts with any person or persons for the due performance of any or all matters connected with the removal and deposit of night-soil, and may make regulations from time to time as to them may seem necessary respecting such contract or contracts; and may also by like regulations determine the price which the owner or owners or occupants of any premises shall pay or be liable to pay the said Council for emptying or cleansing or causing to be emptied and cleansed their cesspools, cesspits, privies, or earth-closets aforesaid; and the said Council may recover such charges as have been fixed by the said Council duly assembled by resolution or otherwise.

16. No person shall be at liberty, without the permission of the Council, or of the Inspector of Nuisances, or other officer appointed on their behalf, to use on his premises any night-soil brought from elsewhere.

17. The owner or occupier of any house, building, or passage, yard, earth-closet, or premises within this Municipality shall cause the same and any part thereof to be kept in a cleanly condition, and so as not to be a nuisance or injurious to health.

18. Any person allowing night-soil to fall or escape into any street, right-of-way, water-channel, gutter, creek, river, or reservoir, or any other public or private place, except as herein provided for, shall forfeit and pay a penalty not exceeding £20 nor less than £2.

19. If at any time the earth-closet in any premises shall overflow or become a nuisance, the owner or occupier shall be liable to a penalty not exceeding £10.

20. The Council may recover from, and the owners or occupiers of the premises shall pay, such sums for the emptying of earth-closets as may be decided upon from time to time by resolution of the Council.

21. The owner or occupier of any premises within the Municipality, or any other person who shall have or erect upon his premises any closet or earth-closet, otherwise than in accordance with these By-laws, or who shall refuse or neglect to comply with the provisions of the preceding By-laws, or who shall commit any breach thereof, shall, in cases where no special penalty is provided, forfeit and pay a penalty not exceeding £5; and any person not being duly licensed or authorized by the Council who shall remove any night-soil or empty any earth-closet shall be liable to a penalty not exceeding, for the first offence, £5, and for every subsequent offence £10.

22. All words occurring in these By-laws, and which also occur in the Nuisances Prevention Act, 1875, shall have the like meanings assigned to them as are provided in the 4th section of the said Act.

23. Any person or persons requiring their cesspools, cesspits, closets, or earth-closets emptied shall leave a written notice at the said Council Chambers, addressed to the Inspector of Nuisances, who shall forthwith, or as early as practicable, apprise the night-soil contractor of the work for which such notice has been given and received. Any person or persons emptying or causing to be emptied any receptacle for the deposit of night-soil, or not delivering such notice as aforesaid, shall be liable to a fine or penalty not exceeding £20.

24. Any person or persons wilfully obstructing the Council or their duly appointed officers or contractors, or any or either of them, in the execution of their duty in any way or manner shall be liable to a fine or penalty not exceeding £5.

Borough Council Chambers,
Wagga Wagga, 23rd November, 1885.

We certify that the foregoing By-laws under the Nuisances Prevention Act were duly passed at a regular meeting of the Borough Council of Wagga Wagga, held on Thursday, the 5th of November instant.

(L.S.) JAMES GORMLY,
Mayor.

J. HAWKES,
Council Clerk.

Sydney: Thomas Richards, Government Printer.—1886.

[3*d*.]

1885–6.

NEW SOUTH WALES.

NUISANCES PREVENTION ACT, 1875.

(BOROUGH OF WALLSEND—BY-LAWS.)

Presented to Parliament, pursuant to Act 39 Vic. No. 14, sec. 18.

Colonial Secretary's Office,
Sydney, 15th April, 1886.

BOROUGH OF WALLSEND.—BY-LAWS.

THE following By-laws, made by the Council of the Borough of Wallsend, for carrying into effect the provisions of the "Nuisances Prevention Act, 1875," having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the above-cited Act.

GEORGE R. DIBBS.

MUNICIPAL DISTRICT OF WALLSEND.—BY-LAWS.

BY-LAWS made by the Council of the Municipal District of Wallsend, for carrying into effect the provisions of the "Nuisances Prevention Act, 1875."

1. All closets, earth-closets, privies, cesspools, and cesspits, within the Municipal District of Wallsend, shall be constructed and kept so as not to be a nuisance or injurious to health, and so that there shall be no overflow or soakage therefrom; in no case where practicable shall a cesspit or cesspool be situated within twenty-five feet from any dwelling or thirty feet from any well.

2. There shall not be formed, dug, or excavated, any earth below the surface for the purpose of making any cesspit, cesspool, or other opening for the receptacle of night-soil, unless by and with the permission of the said Council; all closets made or constructed after this By-law becoming law shall be made or fitted with a moveable receptacle or pan, and such as are usually known as earth-closets, unless the consent of the said Council be given to construct other than an earth-closet.

3. No cesspit, cesspool, or other receptacle for night-soil shall be of greater depth than five feet, four feet six inches in length, and three feet six inches in width, nine inch brick-work set in cement, and cemented inside, so that no soakage can escape therefrom, and that the contents thereof may be readily removed.

4. A separate closet shall be provided for every dwelling-house, and when two or more closets adjoin each other there shall be a properly constructed dividing wall between each closet, commencing at the floor and terminating at the roof; each hotel shall be provided with at least one public closet, and one or more properly constructed urinals, which shall be erected in such situations as the said Council or their officers shall decide upon.

5. The contents of cesspools, cesspits, privies, earth-closets, or other receptacles for night-soil may be removed by contract in properly constructed watertight carts, and the said Council is hereby empowered to enter into any contract or contracts with any person or persons for the due performance of any or all matters connected with the removal and deposit of night-soil, and may make regulations from time to time as to them may seem necessary respecting such contract or contracts, and may also by like regulations determine the price which the owner or owners of or occupants of any premises shall pay or be liable to pay the said Council, for emptying and cleansing, or causing to be emptied or cleansed, their cesspools, cesspits, privies, or earth-closets aforesaid, and the said Council may recover such charges as have been fixed by the said Council duly assembled by resolution or otherwise.

6. When any existing closet, cesspool, cesspit, or similar appliance of any kind shall in the opinion of the said Council, or their duly appointed officer or officers, be injurious to public health, or be or become a nuisance or opposed to common decency, the owner or owners thereof shall upon receiving seven (7) days notice from the said Council, or from their duly appointed officer for that purpose, make such alterations as may be ordered by the said Council or by such officer within the time prescribed by such notice; any owner or occupier neglecting or refusing to comply with the terms of such notice, the said Council shall and may have the required alterations carried out at the costs and expenses of the said owner or occupier thereof; and in the case of neglect or refusal to pay such expense after demand, the same shall and may be recovered in the manner provided by section No. 14 of the "Nuisances Prevention Act, 1875."

7. Any owner or owners of existing closets or soilpits, may be required to alter and improve them in such manner as may be deemed necessary by the said Council, in order to bring them into conformity in all respects with these By-laws, on notice being given by the said Council or by their duly appointed officer for that purpose to that effect; owners or occupiers failing to make such alterations or improvements, within one month after the receipt of such notice, shall be liable to a penalty of not less than one pound nor exceeding the sum of three pounds for each and every week or portion of a week during which they shall fail to comply with the terms of the notice aforesaid.

8. The said Council may from time to time, by regulation or regulations, appoint depôts within the said Municipal District wherein the contents of the closets, cesspools, cesspits, and other offensive matter shall be deposited, and may use, or cause

to be used, such disinfectants as may appear necessary so that the existing matter shall not be a nuisance or injurious to health: Provided also that nothing herein contained shall prevent the said Council from making arrangements to deposit night-soil and other manures on private lands, or disposing of such by sale or otherwise, in accordance with the general provisions of these By-laws; but no person shall be allowed to deposit night-soil, sewerage, or other offensive matter on private lands within the said Municipality without the consent of the Council or their duly appointed officer.

9. The contents of cesspools, cesspits, privies, earth-closets, or other receptacles for night-soil shall be removed in properly constructed watertight carts, approved of by the Council, by persons who have been duly authorized and licensed for the performance of such work by the said Council; and no person shall be allowed to perform such duties of nightman without having first obtained a license from the said Council; and any person infringing this part of the By-laws, shall, on conviction thereof, be subject to a penalty for every such offence of not less than ten shillings nor more than five pounds.

10. All privies, earth-closets, or other receptacles wherein night-soil may be deposited shall be kept in such a state of cleanliness so as not to be a nuisance or injurious to health, and no householder or resident shall allow or permit any such premises to be a nuisance or offensive to neighbouring householders or residents under a penalty of not less than one pound.

11. The occupier of every house, building, or tenement, within the said Municipal District shall cause every cesspit, cesspool, or privy therein, to be emptied and cleansed from time to time, as soon as any portion of the contents of such shall have so accumulated therein as to be within a distance of six inches from the top of such receptacle or cesspit or sooner, on complaint being made and notice given by the said Council's duly appointed officer for the removal of such night-soil: Provided that the contents of any cesspool, cesspit, privy, or closet-pan shall not be removed or discharged therefrom except by some nightman or nightmen duly authorized or licensed as such by the aforesaid Council, and only between the hours of 10 o'clock p.m. and 5 o'clock a.m. No cesspool, cesspit, or privy shall have connected therewith or attached thereto any pipe or other appliances capable of being used for the purpose of discharging or removing the contents of such cesspool, cesspit, or privy, upon or under the surface of any adjoining ground, or into any drain or sewer, or into any other place or places whatsoever. Any person or persons wilfully violating this part of the By-laws in any respect shall be liable to and forfeit and pay a penalty of not less than ten shillings nor more than ten pounds.

12. The occupier of every house, building, or other tenement on or in which the privy or closet belonging thereto shall not be provided with a cesspit shall at all times cause to be kept in such privy or closet a supply of dry powdered earth, ashes, charcoal, lime, or some other material efficient and sufficient for deodorizing the night-soil deposited therein, and shall cause all such night-soil which may be deposited therein in a box, pan, bucket, or other receptacle in such privy or closet, to be immediately, on the deposit thereof, covered with a quantity of dry powdered earth, or such other deodorizing material as aforesaid, sufficient to thoroughly and effectively deodorize the contents of such bucket, pan, or other receptacle.

13. Licensed nightmen for the removal of night-soil shall, under the direction of the Inspector of Nuisances for the time being, or their officer or officers appointed by the said Council, make a trench on the depôts fixed upon by the said Council for the purpose of depositing therein all night-soil that shall from time to time be taken thereto, and the whole of such night-soil shall, as deposited, be covered with earth and disinfectants so as to prevent any nuisance to arise therefrom; and any nightman or other person who shall deposit night-soil either on the appointed depôt, or any other land within the said Municipal District, without covering or otherwise deodorizing the same shall be liable to a penalty of not less than ten shillings nor more than ten pounds.

14. Every cesspool, cesspit, or earth-closet shall be in such a position that the same may be emptied without the contents thereof being carried through any part of any dwelling-house; and any person or persons having or building any cesspool or cesspit contrary to this part of the By-laws shall be liable to a penalty of not less than ten shillings nor more than five pounds.

15. Any person or persons desirous of substituting earth or pan closets for or in lieu of any existing cesspit, cesspool, or privy shall be at liberty so to do on giving notice to the Inspector of Nuisances or other duly appointed officer, who shall, under his hand, give permission in writing for such substitution; no existing cesspit, cesspool, or other receptacle shall be covered over, filled up, or otherwise abandoned without the consent in writing of the Inspector of Nuisances.

16. Any person or persons who intend to construct any privy or closet shall give notice in writing to the Inspector of Nuisances for the time being of their intention so to do, and the said Inspector shall, within forty-eight (48) hours, inspect the premises on which such is intended to be constructed, and if in accordance with these By-laws and the Nuisances Prevention Act shall give the necessary permission for the construction of such closet, any person constructing a closet or other receptacle for the deposit of night-soil without giving such notice and receiving such permission shall, upon conviction, be liable to a penalty of not less than ten shillings nor more than ten pounds.

17. Any person or persons obstructing the said Council or their appointed officers or servants, or any or either of them, in the execution of their duty in any way or manner shall be liable to a penalty not exceeding ten pounds, in accordance with the provisions and powers contained in the "Nuisances Prevention Act, 1875."

18. There shall be paid to the Municipal Council the sum of twenty shillings per annum for a license or permission to act as a nightman; and every person owning two or more night-carts shall pay the sum of ten shillings per annum for each and every cart he may have so employed or engaged in such work.

19. Every person guilty of a breach of any of the provisions of the foregoing By-laws shall be liable for every such offence, when not otherwise expressly provided for, to a fine or penalty not exceeding twenty pounds nor less than ten shillings.

(L.S.) ROBERT WALKER, Mayor.

ELIJAH ABELL, junior, Council Clerk.

Wallsend, February 2nd, 1886.

Sydney: Thomas Richards, Government Printer.—1886

[3d.]

1885-6.

NEW SOUTH WALES.

NUISANCES PREVENTION ACT, 1875.

(BOROUGH OF QUEANBEYAN—BY-LAWS.)

Presented to Parliament, pursuant to Act 39 Vic. No. 14, sec. 18.

Colonial Secretary's Office,
Sydney, 14th April, 1886.

BOROUGH OF QUEANBEYAN.—BY-LAWS.

THE following By-laws, made by the Council of the Borough of Queanbeyan, for carrying into effect the provisions of the "Nuisances Prevention Act, 1875," having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the above-cited Act.

GEORGE R. DIBBS.

BOROUGH OF QUEANBEYAN.

BY-LAWS for the carrying into effect the provisions of the "Nuisances Prevention Act, 1875."

Notice required previous to erection of closets.

134. Every person about to erect a closet or form a cesspit, shall, before he commence any such work, give to the Town Clerk seven days' notice in writing of his intention and of the proposed position of such closet or cesspit, and in default thereof, or in case of his commencing such work without such notice, he shall be liable to a penalty not exceeding £2.

Situation of closet to be approved.

135. No closet shall be erected or cesspit formed, except in such position as shall be approved of by the Council or by the Inspector of Nuisances or other officer appointed by the Council.

Situation and dimensions of cesspits and earth closets.

136. No cesspit shall be built under any dwelling-house, nor at a less distance than 20 feet therefrom, except in case of earth closets, nor in such position that the same cannot be emptied without the contents thereof being carried through any dwelling-house; and no cesspit shall be less than 4 feet long by 3 feet wide, internal measurement, nor of a less depth than 4 feet nor greater than 5 feet below the ground surface, and the walls and floor of every cesspit shall be built of brick or stone, the floor to slope at least 12 inches towards the manhole, and the top of every cesspit shall be not less than 6 inches higher than the highest part of the ground immediately adjoining it.

Size of closets.

137. Every closet shall be built with walls 6 feet high, and shall not be less than 3 feet wide and 4 feet long, internal measurement, and shall be provided with a door capable of being fastened from the inside, and shall have ventilating holes 4½ inches wide.

Double closets to be effectively separated.

138. When two or more closets adjoin each other there shall be a brick or stone dividing wall of not less than 4½ inches in thickness between every two closets, and each wall shall extend from the bottom of the cesspit through the roof of the closet so as to effect a complete separation.

Separate closets for each tenancy.

139. A separate closet shall be provided for every tenement, and a breach of this By-law shall make the owners or occupiers of any premises upon which there shall be a joint closet liable to a penalty not exceeding £5.

Separate closet.

140. In dwelling-houses where the number of persons who shall ordinarily sleep therein shall exceed twelve, a separate closet shall be provided for every twelve persons or fraction of twelve.

Closets for schools and factories.

141. In schools or in factories, or other places of buisness where a number of persons exceeding twelve shall reside or be occupied or employed, one closet shall be provided for every twenty persons, with a cesspit of a capacity of not less than 80 cubic feet, and separate closets shall be provided for each sex.

Notice to be served when alteration necessary.

142. If any alteration shall be requisite in the opinion of the Inspector of Nuisances or any other officer appointed by the Council in that behalf, for preserving public health or decency in the case of any existing cesspit or closet, the owner or occupier of such premises shall receive twenty-one days' notice to remove or alter the same, and if he fail to do so and the Council shall adjudge such cesspit to be either injurious to the health or opposed to decency by exposure or otherwise, the same shall be altered by such Inspector of Nuisances or other officer, and the cost of such alteration shall be paid by the owner or occupier of the premises wherein the same shall be.

Night-soil—place of deposit for.

143. The place of deposit for night-soil shall be in such locality as may be from time to time determined upon by the Council, and no night-soil shall be deposited in any other locality within the Municipality except as allowed by By-laws 149 and 150.

Night-soil—Council's servants to remove.

144. Until otherwise provided by the Council, all night-soil shall be removed from cesspits by servants of, or contractors with, the Council, in water-tight covered vehicles, between the hours of 10 o'clock in the evening and 5 o'clock in the morning

Night-soil—how disposed of.

145. Until and unless otherwise provided by the Council, all night-soil shall be disposed of by burying in and mixing with the earth.

Night-soil to be deodorised or otherwise treated.

146. In case the Council shall sell or give away any night-soil, the same shall be removed in the same manner as above provided, and on being removed from the vehicles in which it is carried, it shall be deodorised by chemicals, or in some other manner, or covered and mixed with earth so as to prevent any offensive smell arising therefrom.

Hours of visit of Inspector of Nuisances.

147. The Inspector of Nuisances or other officer appointed by the Council may visit or inspect any premises or do any work authorised by the Nuisances Prevention Act of 1875, on all days, except Sundays and public holidays, between the hours of 10 o'clock in the morning and 4 o'clock in the evening.

Earth closets—notice to be given of intention to erect.

148. Any person desirous of erecting an earth closet shall be at liberty to do so after giving notice of his intention to do so to the Inspector of Nuisances or other officer appointed by the Council, but all night-soil shall be removed therefrom once in four days, and if such closet shall be within any dwelling once within twenty-four hours or oftener, and buried in the earth.

Night-soil from earth closets—how disposed of.

149. Every person shall be at liberty to use on his own premises all night-soil collected therefrom, but if any nuisance shall arise therefrom he shall be liable to a penalty not exceeding £5.

Restrictions regarding use of night-soil.

150. No person shall be at liberty without the permission of the Council or of the Inspector of Nuisances or other officer appointed on that behalf, to use on his premises any night-soil brought from elsewhere.

Yards and drains to be kept clean.

151. The owner or occupier of any house, building, passage, yard, or premises within this Municipality shall cause the yard ground adjoining or belonging thereto, as well as all drains in connection therewith, to be kept in a cleanly condition, and so as not to be a nuisance or injurious to health.

Night-soil or other offensive matter not to flow from premises, &c.

152. Any person allowing night-soil from any closet to fall into any street, right-of-way, water channel, gutter, creek, river, or reservoir, or in any other public place, or wilfully allowing filth of any kind or accumulation thereof, or any substance or substances from which noxious effluvia arise, to remain upon his premises or flow therefrom, shall forfeit and pay a sum not exceeding £20 nor less than £2.

Notice to be given in case of overflowing of cesspits.

153. If at any time the cesspit in any premises shall overflow, the owner or occupier shall, within 24 hours, give notice to the Inspector of Nuisances, otherwise such owner or occupier shall be liable to a penalty not exceeding £10.

Council may recover costs for emptying.

154. The Council may recover, and the owner or occupier of the premises shall pay such sums for the emptying of cesspits as may be decided upon from time to time by resolution of the Council.

Penalties

155. The owner or occupier of any premises within the Municipality, or any other person who shall have or erect upon his premises any closet or cesspit otherwise than in accordance with these By-laws, or who shall refuse or neglect to comply with the provisions of any of the preceding By-laws, or who shall commit any breach thereof shall (in cases where no special penalty is provided) forfeit and pay a penalty not exceeding £5.

Interpretations.

156. All words occurring in these By-laws, and which also occur in the "Nuisances Prevention Act of 1875" shall have the like meanings assigned to them as are provided in the fourth section of the same Act.

Made and passed by the Council of the Borough of Queanbeyan, this 25th day of January, 1886.

(L.S.) J. J. WRIGHT,
Mayor.

WM. H. NICHOLLS, Council Clerk.

Sydney: Thomas Richards, Government Printer.—1886.

[3d.]

1885–6.

NEW SOUTH WALES.

NUISANCES PREVENTION ACT, 1875.

(MUNICIPAL DISTRICT OF HAMILTON—AMENDED BY-LAW.)

Presented to Parliament, pursuant to Act, 39 Vic. No. 14, sec. 18.

Colonial Secretary's Office,
Sydney, 5th August, 1886.

MUNICIPAL DISTRICT OF HAMILTON—AMENDED BY-LAW.

THE following Amended By-law made by the Council of the Municipal District of Hamilton, for carrying into effect the provisions of the "Nuisances Prevention Act, 1875," having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the above-cited Act.

GEORGE R. DIBBS.

MUNICIPAL DISTRICT OF HAMILTON.—AMENDED BY-LAW.

THE following Amended By-law has been made by the Municipal Council of Hamilton for the better carrying out of the provisions of the "Nuisances Prevention Act, 1875," within the Municipal District of Hamilton.

By-law number 3 of the By-laws published in the Government Gazette of 23rd October, 1884, is hereby repealed, and in lieu thereof the following By-law shall stand as No. 3 of the aforesaid By-laws:—

3. No cesspit, cesspool, or other receptacle for night-soil shall be of greater depth than five feet, four feet six inches in length, and three feet six inches in width, and shall be built of nine (9) inch brickwork, set in cement, and rendered half-an-inch thick with cement, mixed in the proportion of one of cement to three of clean sharp sand, so that no soakage can escape therefrom, and that the contents thereof may be readily removed; and any person violating the provisions of this By-law shall be liable to a penalty not exceeding £10, nor less than £2.

Made and passed by the Municipal Council of the Municipal District of Hamilton, this nineteenth day of May, in the year of our Lord one thousand eight hundred and eighty-six.

(L.S.) SAMUEL DONN,
Mayor.

JAMES RAY,
Council Clerk.

1885-6.

NEW SOUTH WALES.

NUISANCES PREVENTION ACT, 1875.

(BOROUGH OF ALBURY—REPEAL OF BY-LAW.)

Presented to Parliament, pursuant to Act 39 Vic. No. 14, sec. 18.

Colonial Secretary's Office,
Sydney, 18th August, 1886.

BOROUGH OF ALBURY—REPEAL OF BY-LAW.

THE following By-law made by the Council of the Borough of Albury, repealing No. 16 of the By-laws for carrying into effect the provisions of the "Nuisances Prevention Act, 1875," in that Municipality, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the abovecited Act.

GEORGE R. DIBBS.

By a resolution passed by the Borough Council of Albury at a meeting held on the 28th day of April, 1886, the following clause, No. 16 of the By-laws made under the "Nuisances Prevention Act, 1875," is hereby repealed, viz.:—

No. 16. Every person shall be at liberty to use on his own premises all night-soil collected thereon; but if any nuisance shall arise therefrom he shall be liable to a penalty not exceeding £5.

The seal of the Municipality of Albury was herewith attached.

(L.S.) G. H. BILLSON,
Mayor.

In the presence of,—
JNO. H. PAINE,
Council Clerk.

1885-6.

NEW SOUTH WALES.

NUISANCES PREVENTION ACT, 1875.

(BOROUGH OF ALEXANDRIA—BY-LAWS.)

Presented to Parliament, pursuant to Act 39 Vic., No. 14, sec. 18.

Colonial Secretary's Office,
Sydney, 7th September, 1886.

BOROUGH OF ALEXANDRIA—BY-LAWS.

THE following By-laws made by the Council of the Borough of Alexandria, under the "Nuisances Prevention Act, 1875," having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the above-cited Act.

GEORGE R. DIBBS.

BY-LAWS of the Borough of Alexandria, made under and for carrying into effect the provisions of the "Nuisances Prevention Act."

1. Every person who shall be about to erect a closet, or form, excavate or make a cesspit, shall, before he shall commence to erect such closet, or to form, excavate, or make any such cesspit, deliver to the Council Clerk of the Borough of Alexandria notice in writing of the intention of such person to erect such closet, or form, excavate, or make such cesspit, and of the place or position in which it is intended that such closet shall be erected, or such cesspit formed, excavated, or made; and if any person shall commence to erect any closet, or to form excavate, or make any cesspit within the said Borough without having given such notice in writing as aforesaid, and before the expiration of seven days after the delivery of such notice (except by written authority of the Inspector of Nuisances for the said Borough, or other officer for the time being appointed by the Council of the said Borough in that behalf), he shall forfeit and pay a penalty of not more than five pounds nor less than one pound.

2. No person shall erect or commence to erect any closet, or to form, excavate, or make any cesspit except in such place or position as shall be approved by the Inspector of Nuisances or other officer as aforesaid; and any person who shall erect or commence to erect, any closet, or to form, excavate, or make any such cesspit without having obtained the approval of the said Inspector or other officer, or in any place or position other than the place or position approved of by the said Inspector or other officer as aforesaid, shall forfeit and pay a penalty of not less than ten shillings nor more than forty shillings; but any person who shall feel aggrieved by the decision of such Inspector or other officer may appeal against the same to the Council.

3. Every cesspit to be constructed within the Borough shall be built of 9-inch brickwork set in cement, and the top of such cesspit shall be at least 6 inches higher than the highest part of the surface of the ground immediately adjoining such cesspit, and no cesspit shall be formed, excavated, or made under any dwelling-house, nor at a less distance than 20 feet therefrom, area permitting. If any person shall so form, excavate, or make any cesspit which shall not be in accordance with the provisions of this By-law, or shall form, excavate, or make any cesspit under any dwelling-house, or at a less distance than 20 feet, area permitting, shall forfeit and pay a penalty of not more than five pounds, nor less than two pounds.

4. For houses containing not more than four rooms and out-offices, the cesspit shall not be less than 3 feet by 4 feet and 5 feet deep, inside measurement; for houses containing more than four rooms and out-offices, the cesspit shall not be less than 3 feet 6 inches by 4 feet and 5 feet deep, inside measurement.

5. Every closet shall be built with walls 7 feet high, and shall not be less than 3 feet 6 inches wide and 4 feet 6 inches long, and shall be provided with a door capable of being fastened inside and with a man-hole not less than 2 feet square, clear internal measurement, to be covered with a trap-door; and every person who shall build or erect any closet which shall not be in accordance with this By-law shall forfeit and pay a penalty of not more than two pounds nor less than ten shillings.

6. Where two or more closets adjoin each other there shall be a sufficient dividing wall not less than 9 inches in thickness between every two closets, and such wall shall extend from the bottom of the cesspit up to the roof of the closet, so as to effect a complete separation; and if any person shall erect any two or more closets adjoining each other, and not in accordance with this By-law, he shall forfeit and pay a penalty of not more than two pounds nor less than ten shillings.

7. A separate closet shall be provided for each tenement, and any person offending against the provisions of this By-law shall forfeit and pay a penalty of not more than five pounds nor less than two pounds.

8. In schools, factories, or other places of business where a number of persons exceeding twelve shall ordinarily reside or be occupied or employed, one closet shall be provided for every twenty persons, with a cesspit of a capacity of not less than 80 cubic feet, and separate closets shall be provided for each sex; and every owner, occupier, or tenant of such school, factory, or other place of business, and every other person who shall offend against this By-law or fail to provide the number of closets and of the capacity in this By-law mentioned, shall forfeit and pay a penalty of not more than five pounds nor less than one pound.

9. If any alterations shall be requisite, in the opinion of the Inspector of Nuisances or other officer appointed by the Council in their behalf, for preserving public health or decency in case of any existing cesspit or closet, and the Council shall adjudge such cesspit or closet to be injurious to the health or opposed to decency by exposure or otherwise, and the owner or occupier shall not make the necessary alterations after receiving fourteen days notice from the Council Clerk, it shall be lawful for the Inspector of Nuisances or other officer appointed by the Council to remove the said nuisance, and any expense incurred thereby may be sued for and recovered in a summary way before any two or more Justices of the Peace.

10. Owners of existing closets and soilpits may be required to alter or improve them in such manner as may be necessary in order to bring them into conformity with these regulations, on notice being given by the Inspector of Nuisances to that effect; persons failing to make such alterations or improvements within one month after the receipt of such notice shall be liable to a penalty of not less than one pound nor exceeding the sum of three pounds for each and every week or portion of a week during which they shall fail to comply with the terms of the said notice.

11. The night-soil shall be removed by contract in properly constructed water-tight covered vehicles, between the hours of 10 p.m. and 5 a.m., from the first day of October to the last day of March, and between the hours of 10 p.m. and 6 a.m., from the first day of April to the last day of September.

12. Persons desirous of using earth closets may be permitted to do so on making written application to the Council, and intimating the arrangements to be made for their construction and management, provided that such arrangements shall be approved by the Council.

13. The Inspector of Nuisances or other officer appointed by the Council may visit and inspect any premises, or do any work authorized by the Nuisances Prevention Act of 1875 thereon, on all days except Sundays and holidays, and any person who shall hinder or obstruct any Inspector of Nuisances or other officer as aforesaid upon any such visitation or inspection, or in the doing or performing of any work, shall forfeit and pay a penalty of not more than two pounds nor less than ten shillings.

The Inspector of Nuisances shall furnish the Council with a monthly return showing the number of cesspits emptied, the amount due and payable for each cesspit, and the amount of arrears due for emptying cesspits. He shall collect the amounts so due and payable, and account therefor to the Council at least once a month, or as may be determined upon by the Council.

(L.S.) C. JESSON, Mayor.

KELSON VAUGHAN, Council Clerk.

Town Hall, Alexandria,
14th May, 1886.

Sydney: Thomas Richards, Government Printer.—1886.

[3d.]

1885-6.

NEW SOUTH WALES.

NUISANCES PREVENTION ACT, 1875.

(BOROUGH OF BURWOOD—BY-LAW.)

Presented to Parliament, pursuant to Act 39 Vic., No. 14, sec. 18.

Colonial Secretary's Office,
Sydney, 20th September, 1886.

BOROUGH OF BURWOOD.—BY-LAW.

THE following By-Law made by the Council of the Borough of Burwood under the "Nuisances Prevention Act, 1875," having been confirmed by His Excellency the Governor, with the advice of the Executive Council, is published in accordance with the requirements of the above cited Act.

GEORGE R. DIBBS.

BY-LAW UNDER THE NUISANCES PREVENTION ACT, 1875.

Every closet shall be supplied with a box or other receptacle for dry earth, sand, or ashes, of which a quantity, sufficient to deodorise the excreta therein, shall be deposited in the closet-pan daily.

Any person committing a breach of this By-Law shall, on conviction, forfeit and pay a penalty of for the first offence ten shillings; and for the second or any subsequent offence, not less than ten shillings nor more than forty shillings.

Passed at a meeting of the Burwood Council held on Monday, the 14th June, 1886.

(L.S.) J. F. WILSHIRE,
Mayor.

W. REDFEARN, Council Clerk.

1885-6.

NEW SOUTH WALES.

MUNICIPALITIES ACT OF 1867, AND NUISANCES PREVENTION ACT, 1875.

(BOROUGH OF ALBURY—BY-LAWS.)

Presented to Parliament, pursuant to Acts 31 Vic. No. 12, sec. 158, and 39 Vic. No. 14, sec. 18.

Colonial Secretary's Office,
Sydney, 16th December, 1885.

BOROUGH OF ALBURY.—BY-LAWS.

THE following By-laws, made by the Council of the Borough of Albury, under the "Municipalities Act of 1867" and the "Nuisances Prevention Act, 1875," respectively, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the abovecited Acts.

P. A. JENNINGS.

BY-LAWS.

PUBLIC GARDENS.

Hours.

1. The gardens and other public places of recreation under the management or control of the Council, and herein called "The Gardens," shall be open every day.

Injury to things in gardens.

2. No person shall pluck any of the flowers, or walk on the beds or borders, or climb upon or get over the fences, or remove any of the tallies, or disturb, damage, or destroy any property or thing in the gardens.

Shooting, &c.

3. No person shall carry firearms through the gardens, or shoot, snare, or destroy any wild fowl either in the gardens or in or on any water adjacent thereto, or bathe in any such water.

Driving carts.

4. No cart or other vehicle used for the conveyance of goods, shall, without the authority of the proper officer of the Council, be driven through the gardens.

Supplying plants, &c.

5. Such plants, seeds, or cuttings as are commonly purchasable at nurseries in New South Wales shall not be supplied from the gardens to any person, unless in exchange, or for public institutions, or for benevolent purposes.

Behaviour, &c.

6. No visitor shall interrupt the gardeners or labourers by conversation or otherwise, or shall use any abusive, improper, or unbecoming language to any person in such gardens, or otherwise annoy any such person; or behave in an indecent, improper, or unbecoming manner in such gardens; or sit or lie on the borders or walks except on seats provided by the Council.

Children.

7. Children under the age of ten years, not being under the control of some competent person, shall be removed from the gardens.

Dogs.

8. All dogs and goats and all poultry found within the gardens shall be destroyed, and the owner shall make compensation for any damage done; and no visitor shall be permitted to bring any dog into the gardens otherwise than under proper control of chain or cord, and any person permitting any dog to follow him or her into the gardens who shall refuse to immediately remove such dog, or to place such dog under control of chain or cord when requested so to do by the proper officer of the Council, or gardener, or labourers employed in such gardens, shall have offended against this By-law.

Penalties.

9. Any person offending against this By-law shall, for the first offence, forfeit and pay any sum not exceeding five pounds; for a second offence, any sum not less than ten shillings nor more than ten pounds; and for a third and every subsequent offence, any sum not less than one pound nor more than twenty pounds. And any person may, on committing any such offence, be forthwith removed from the gardens by the proper officer of the Council, or by any of the gardeners or labourers employed in such gardens, without affecting the liability of such person so offending to be subsequently prosecuted for such offence.

ADDITIONAL BY-LAWS FOR THE PREVENTION OF NUISANCES.

Dead animals—mode of removal.

1. If any animal shall die in any part of the said Municipality and the owner of such animal or the occupier of the place, if private property, where such animal shall have died shall not cause such animal to be immediately destroyed by fire, or so effectually removed and disposed of that no nuisance can possibly result therefrom in any part of the Municipality, he shall for every such offence forfeit and pay any sum not exceeding fifty pounds nor less than two pounds.

Dead animals on road or street, &c.

2. If any animal shall die on any road, street, or public place within the said Municipality, or within half-a-mile of any road, street, or public place, or of any dwelling house, and the owner or any person in charge of such animal or the occupier of the place, if private property where such animal shall have died, shall not immediately cause such animal to be effectually removed and destroyed as aforesaid or removed as aforesaid, on the spot where it shall have died, if a quarter of a mile from any dwelling-house, or if such spot shall not be a quarter of a mile from any dwelling-house, or if such owner or person in charge or occupier shall not immediately cause such animal to be effectually removed as aforesaid or to be removed to some place not less than a quarter of a mile from any dwelling-house and there destroyed as aforesaid, every such owner or person in charge or occupier shall for every such offence forfeit and pay any sum not exceeding ten pounds nor less than two pounds.

Power of Inspector as to dead animals on private premises.

3. The Inspector of Nuisances, or any other officer appointed by the Council of the said Municipality, with his assistant, may at any hour enter upon any premises or place within the said Municipality where any animal has died, and require the owner or occupier of such premises or place immediately to destroy such animal by fire and, if necessary, to remove the same for that purpose, as such Inspector of Nuisances or other officer appointed by the said Council shall direct, or otherwise forthwith effectually to remove and dispose of the same as aforesaid, in default of which it shall be lawful for any one or more of such officers to cause such animal to be removed for that purpose; and every owner or occupier of such premises or place failing, neglecting, or refusing to comply with such requisition shall forfeit and pay any sum not exceeding thirty pounds nor less than three pounds.

Dead animals in certain cases to be removed at cost of Municipality.

4 If any animal shall die in any public place or street within the said Municipality and the owner or any person having charge of such animal cannot at the time be found or ascertained, it shall be immediately removed by the Inspector of Nuisances or other officer appointed by the said Council and destroyed in manner aforesaid at the cost of the Municipality.

Passed by the Borough Council of Albury, this thirteenth day of May, in the year of our Lord, one thousand eight hundred and eighty-five.

(L.S.) G. H. BILLSON,
Mayor.

JNO. H. PAINE,
Council Clerk.

Sydney Thomas Richards, Government Printer.—1886.

[3*d.*]

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES ACT OF 1867, AND NUISANCES PREVENTION ACT, 1875.

(BOROUGH OF BURWOOD—BY-LAWS.)

Presented to Parliament, pursuant to Acts 31 Vic. No. 12, sec. 158, and 39 Vic. No. 14, sec. 18.

Colonial Secretary's Office,
Sydney, 30th January, 1886.

BOROUGH OF BURWOOD.—BY-LAWS.

THE following additional and amended By-laws, under the Municipalities Act of 1867, and By-laws for carrying into effect the provisions of the "Nuisances Prevention Act, 1875," made by the Council of the Borough of Burwood, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the abovecited Acts.

JOHN ROBERTSON.

ADDITIONAL and amended By-laws adopted at the meeting of the Council held on the 7th May, 1885, under the provisions of the Municipalities Act, 1867.

Days of ordinary Meeting.

Amended Part I, No. 1.

The Council shall meet every alternate Monday at the hour of half-past 7 in the evening, or on such other day and at such hour as may by resolution of the Council be from time to time appointed.

Rates to be paid at the Council Chambers.

Amended Part II, No. 3.

All persons liable to pay any rates as aforesaid, shall pay the amount thereof within the time prescribed by the said Act into the Council Chambers during office hours, that is to say, from 4 to 5·30 p.m. daily, except Saturday and every second and fourth Wednesday in each month from 7 to 9 p.m.

Noisome Weeds.

Additional to follow Sec 6, Part III.

That every owner or occupier, upon whose land or premises are found growing any weeds known as the Bathurst burr, Scotch thistle, sweet briar, or other noisome weeds, shall, on being required by the Inspector of Nuisances, or any other officer of the Council, cause the same to be destroyed, failing which shall be liable to a penalty not exceeding £2 nor less than 10s.

Slops, nightsoil, &c., to be conveyed away only at certain hours.

Amended No. 14, Part III.

Any person or persons who shall drive or cause to be driven any cart or other carriage with any nightsoil or ammoniacal liquor therein, through or in any street or public place within the said borough between the hours of 5 o'clock in the morning and 10 o'clock at night, or shall fill any cart or other carriage so as to turn over or cast any night-soil, ammoniacal liquor, slops, mire, or channel dirt, or filth, in or upon any such street or public place, or shall deposit night-soil, ammoniacal liquor, or other offensive matter, nearer to any street, road, or dwelling-house, than 20 feet, or shall remove night-soil or other offensive matter otherwise than in properly covered and watertight carts or other vehicles, or shall cause any vehicle used for this purpose to stand on any premises nearer to any road, street, or dwelling-house than shall be directed by the said Council, or the said Inspector of Nuisances, shall for every such offence forfeit and pay any sum not exceeding five pounds; and in case the person so offending shall not be known to the said Council or Inspector, then the owner of such cart or carriage in which such night-soil or other offensive matter shall be put or placed, and also the employer of the person so offending, shall be liable to forfeit and pay such penalty as aforesaid.

Dead animals, &c., not to be thrown into any public watercourse, street, or thoroughfare.

Amended No. 19, Part III.

Any person who shall cast any filth, rubbish, or any dead animal, or any animal with intent of drowning, into any public watercourse, sewer, waterhole, river, creek, or canal, or who shall permit or suffer slops, suds, or filth, to flow from his or her premises over any of the footways, or into or upon any public street or thoroughfare of the Borough, or shall by means of pipes, shoots, channels, or other contrivances permit or cause water from his or her premises to flow over such pathways, or shall obstruct or divert from its channel any sewer or watercourse, river, creek, or canal, shall forfeit any sum not exceeding five pounds.

Cleansing Butchers' Shambles, Slaughter-houses, &c.

Amended No. 23, Part III.

It shall not be lawful for any person to prosecute his or her trade by slaughtering any cattle, sheep, or pigs within the limits of the Borough: and the Inspector of Nuisances, or any other person appointed by the Council, shall have full power, without any other authority than this By-law, to go upon any premises for the purpose of ascertaining whether a breach of this By-law has been committed; and any person who shall be guilty of such offence shall, upon conviction, forfeit and pay any sum not exceeding twenty pounds.

Amended No. 24, Part III.

Upon the representation of any householder that the house, premises, yards, closets, drains, ashpits, or hogstyes of the neighbouring or adjoining premises are a nuisance or offensive, the Inspector of Nuisances, or any other person appointed by the Council, shall make an inspection of the premises complained of; and the officer of the Council shall have full power, without any other authority than this By-law, to go upon such premises for the aforesaid purpose; and if any such premises shall be found to be a nuisance or otherwise offensive, notice in writing shall be given to the proprietor or resident of such premises that if, within forty-eight hours after the service of such notice, the nuisance shall not be removed, the Council may, by their Inspector, cause the same to be removed, the proprietor, tenant, or occupant of the aforesaid premises shall, upon conviction, be liable to any penalty not exceeding twenty pounds, in addition to the cost of such removal where it shall have been done by the Council.

Placing Carriages, Goods, &c., on Footways, &c.—Not removing when required—Replacing the same after removal.

Additional to follow Clause 1, No. 25, Part III.

Any person who shall set or place, or cause or permit to be set or placed, any stall-board, chopping-block, show-board (on hinges or otherwise), basket wares, merchandise, casks, or goods of any kind whatsoever, in or upon or over any carriage or foot way in any street or public place within the said Borough, or shall place, or cause to be placed, any coach, cart, waggon, dray, wheelbarrow, handbarrow, sledge, truck, or other carriage upon any such carriage-way or foot-way, except for the necessary time of loading and unloading, or taking up or setting down any fare, or waiting for passengers when actually hired, or harnessing or unharnessing the horses or other animals; or if any person shall set or place, or cause to be placed, in or upon or over any such carriage or foot way any timber, stones, bricks, lime, or other materials or things whatsoever, or shall hang out or expose, or shall cause or permit to be hung out or exposed, any meat or offal, or other thing or matter whatsoever, from any house or other building or premises, over any part of any such foot-way or carriage-way, or over any area of any house or other building or premises, and shall not immediately and permanently remove all or any such matters or things, being thereto required by the Inspector of Nuisances or other proper officer of the Council, shall, upon conviction, for every such offence forfeit and pay for the first offence a sum not exceeding forty shillings nor less than ten shillings, for the second offence a sum not exceedings five pounds nor less than one pound, and for a third and every subsequent offence a sum not exceeding ten pounds nor less than two pounds.

Additional.

All persons standing or loitering upon any of the carriage-ways, foot-ways, or other public places in the Borough of Burwood, to the inconvenience of passers-by, or in any way interrupting the traffic, who shall not discontinue to do so on being required by any officer or servant of the Council of the said Borough, or by any police officer, shall be liable to a penalty not exceeding two pounds nor less than ten shillings.

Amended No. 29, Part III.

No person shall be permitted to drive horses, sheep, or cattle (other than milch cows) on any part of the Borough, except Driver's Road; and any one infringing this By-law shall, upon conviction, forfeit and pay a penalty of not exceeding five pounds for every offence.

Additional to follow Sec. 18, Part III.

The owner or occupier of any property having an entrance for vehicles across the foot-way into his premises shall, at his own cost, put down cube-sets or other substantial material on such crossing, to the satisfaction of the Council; and where such owner or occupier shall fail to put down such cube-sets or other material within one month after receiving notice so to do from the Overseer of Works, the Council may have the work done at his cost, and recover the same in the usual way.

(L.S.) E. SANDERS,
Mayor.

W. REDFEARN,
Council Clerk.

By-laws of the Borough of Burwood, made under and for carrying into effect the provisions of the Nuisances Prevention Act, 1875.

1. After the expiration of three months from the date of the passing of these By-laws no person or persons shall be permitted to have on their premises any open closet or cesspit for the deposit of fœcal matter, and any person or persons allowing any such closet or cesspit to remain after receiving twenty-eight days' notice to remove the same, shall forfeit a sum not exceeding five pounds nor less than one pound, and after such conviction, if not removed within a further period of fourteen days, shall upon conviction forfeit a further sum not exceeding five shillings nor more than two pounds for ever day that the same shall remain unaltered or unremoved.

2. All closets shall be supplied with one or more iron pans with two side handles or one over handle, and shall be not more than fourteen inches in depth, and not more than fourteen inches in diameter, and shall be kept in good order to the satisfaction of the Inspector of Nuisances. Breach of this By-law to carry a penalty not less than ten shillings and not more than forty shillings.

3. No person shall be permitted to cover up or cause to be covered up any existing cesspit with earth or other material prior to giving notice to the Inspector of Nuisances, until the same shall have been properly emptied by the Council's contractor. Any person offending against this By-law shall be liable to a penalty not exceeding five pounds nor less than one pound.

4. A separate closet shall be provided for every tenement. In schools or factories, where a number of persons shall be employed, separate closets shall be provided for each sex; with a door to fasten on the inside. Where two or more closets adjoin each other, there shall be a dividing wall between each to effect a complete separation; and any person offending against the provisions of this By-law shall incur a penalty not exceeding ten pounds nor less than two pounds.

5. If in the opinion of the Inspector of Nuisances any alteration is required in existing cesspits, or closets, he shall report the same to the Council, who shall determine what alteration is necessary for the preservation of health and decency; and such alteration shall forthwith be made by the owner of the premises after receiving seven days' notice to that effect under a penalty for each weeks' neglect or delay in effecting such alteration not exceeding five pounds nor less than two pounds.

6. The nightsoil shall be removed by contract in properly constructed watertight carts, between such hours as the Council may determine; and the contractor shall be held responsible for the careful conveyance of the nightsoil outside the limits of the Borough under a penalty for neglect not exceeding twenty pounds nor less than five pounds.

7. The Inspector of Nuisances shall have power to visit and inspect any premises on any lawful day between the hours of 10 a.m. and 4 p.m.; and any person refusing admittance or obstructing or hindering the officer in the discharge of his duty, shall incur a penalty not exceeding five pounds nor less than one pound.

8. The Council shall from time to time fix the charges to be made for emptying and removing nightsoil from closets, which shall be emptied as often as may be necessary in the opinion of the Inspector of Nuisances.

9. No closet shall be erected or commenced to be erected except in such place or position as shall be approved of by the Council, and any person being guilty of a breach of the By-law shall be liable to a penalty of not less than one pound nor more than five pounds.

10. When any new building is about to be constructed, the builder or builders thereof shall first erect, or cause to be erected on the premises, a temporary closet not less than three feet by two feet six inches, for the use of the workmen employed in the construction of the new building; and any person neglecting to conform to this By-law shall be liable to a penalty not exceeding five pounds nor less than one pound.

11. No person shall be permitted to connect any closet with any drain, water-course, or sewer, without the sanction of the Council. Any person so offending shall be liable to a penalty not exceeding twenty pounds nor less than five pounds.

12. Persons requiring their closets emptied shall send written notice to the Council or the Inspector of Nuisances; and any person wishing to use the refuse from dry earth closets shall be at liberty to do so by making proper provision for emptying the same to the satisfaction of the Inspector of Nuisances; and any person causing a nuisance from the careless use of such closet, shall be liable to a penalty not exceeding five pounds nor less than one pound.

Adopted at a meeting of the Burwood Council held on the 28th May, 1885.

W. REDFEARN,
Council Clerk.

(L.S.) E. SANDERS,
Mayor.

[3d.]

Sydney: Thomas Richards, Government Printer.—1886.

1885–6.

NEW SOUTH WALES.

MUNICIPALITIES ACT OF 1867 AND NUISANCES PREVENTION ACT, 1875.

(BOROUGH OF DARLINGTON—BY-LAWS.)

Presented to Parliament, pursuant to Acts 31 Vic. No. 12, sec. 158, and 39 Vic. No. 14, sec. 18.

Colonial Secretary's Office,
Sydney, 9th August, 1886.

BOROUGH OF DARLINGTON—BY-LAWS.

THE following By-Laws made by the Council of the Borough of Darlington, under the "Municipalities Act of 1867" and the "Nuisances Prevention Act, 1875," respectively, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the above cited Acts.

GEORGE R. DIBBS.

SEWERAGE By-Laws of the Borough of Darlington, made under the Municipalities Act of 1867 and the Nuisances Prevention Act, 1875, respectively.

1. It shall not be lawful for any person, without notice to the Council or otherwise than according to directions as such Council may make and give, to make or branch any private drain or sewer into any of the public drains, sewers, or channels, or into any drain or sewer communicating therewith.

And in case any person or persons shall make or branch any private drain or sewer into any of the said public drains or sewers, or into any drain or sewer communicating or to communicate therewith, without such notice, or otherwise than as aforesaid, shall for every such offence forfeit and pay any sum not exceeding five pounds.

2. In all cases where it is intended to connect a pipe to the drain or sewer of any other premises, a written premission from from the owner or agent of such premises must be sent to the Council Chambers before the authority to connect will be granted, and where the same is not done the drainer shall be liable to a penalty not exceeding three pounds and not less than one pound.

3. Drains or sewers communicating with any public drain or sewer shall from time to time be repaired and cleansed under inspection and by the directions of the Council. And in case any person shall neglect to repair and cleanse or cause any such private drain or sewer to be repaired and cleansed, according to the direction of the said Council, he shall forfeit and pay for every such offence any sum not exceeding two pounds.

4. All drain pipes must be laid at least three feet below the surface of the roadway and gutters, and must be well and fully luted with strong, clean, well-tempered clay free from sand, dirt, or rubbish, both inside and outside the premises.

5. Connecting drains shall be six inches in internal diameter, and laid at a uniform gradient of not less than one foot in sixty feet, unless otherwise authorised, and as far as practicable in straight lines. Where several drains converge, a brick pit must be built, and the drains connected therewith by stoneware flap junctions or other stench traps as the Council's Overseer may direct.

6. All drains shall remain uncovered until inspected by the Overseer of Works, and approved by him. Any work covered over before inspection shall be re-opened for that purpose, and any drainer refusing to open the trenches will be liable to a penalty not exceeding two pounds, and shall further be liable at the discretion of the Council to be deemed ineligible to do any such work in the Borough.

7. The drainer will be held liable for all accidents arising from neglect on his part in providing night lights and proper hoarding for any trenches he may require to make or for want of proper scaffolding or other timbering.

8. The drainer shall take care that the portion of the streets and footpaths opened by him shall be left in the same state of repair as he found them, by the street being properly made up, and the trench being well rammed and filled in, the ballast must be hand packed, and the metal evenly spread over it; and where kerbing, guttering, or asphalting may be disturbed, the same must be carefully and substantially relaid to the satisfaction of the Overseer of Works. And if the same is not done satisfactorily at the request of the overseer, the contractor shall then forfeit and pay for the offence a sum not less than two pounds nor more than five pounds.

9 Accidents to water, sewer, or gas-pipes must be at once reported to the proper authorities, and immediate steps taken to have repairs effected under a penalty of a sum not exceeding two pounds.

10. Privy cesspits will not be allowed to exist on premises where sewer passes property, and which may be capable of being connected.

Proper sinks and cesspools, shall be constructed to receive the kitchen and house slops and drained to sewer.

All yards, gullies, sinks, cesspools, or other openings are to be stench trapped.

All connections with brick main sewers shall be provided with approved traps, as authorised, and stoneware pipes shall be used for all drains.

Existing drains may be made use of subject to the approval of the overseer.

Any violation of the provisions of this By-law shall entail a penalty not exceeding ten pounds nor less than two pounds.

11. The water from roofs of houses, or water falling into yards, must be discharged by separate pipes into the gutter in either street or lane, or as directed by the Council's overseer. And any owner or occupier failing to carry out this provision shall be liable to a sum not exceeding two pounds for every day after fourteen days' notice (in writing) shall have been given by the Council's overseer to remedy the same.

12. No connection from a water pipe direct to the pan of a closet will be allowed.

All water closets shall have cisterns attached with two compartments with ball cock and valve, so arranged that no more than two gallons of water can be used for flushing at any one time.

13. All drains, extensions, alterations, or enlargements to the sewers of the Borough must be executed by licensed drainers only, and they shall pay, on application for sewerage purposes, a fee of two shillings and sixpence for each house.

14. Where no penalty is mentioned, every person committing a breach of any of these By-laws, shall, for every such offence, be liable to a penalty of a sum not exceeding ten pounds; and any person obstructing any officer in the discharge of any duty imposed, or in the exercise of any privilege conferred, by any of these By-laws, shall be liable to a penalty of a sum not exceeding five pounds.

Made and passed by the Borough Council of Darlington at a meeting held on the fourth day of May, in the year one thousand eight hundred and eighty-six.

(L.S.) WILLIAM CRISPIN, Mayor.
JOHN WHITEHEAD, Council Clerk.

1885–6.

NEW SOUTH WALES

MUNICIPALITIES ACT OF 1867 AND NUISANCES PREVENTION ACT, 1875.

(MUNICIPAL DISTRICT OF CANTERBURY—AMENDED AND ADDITIONAL BY-LAWS.)

Presented to Parliament, pursuant to Acts 31 Vic. No. 12, sec. 158, and 39 Vic. No. 14, sec. 18.

Colonial Secretary's Office,
Sydney, 27th September, 1886.

MUNICIPAL DISTRICT OF CANTERBURY.—BY-LAWS.

THE following amended and additional By-laws, under the "Municipalities Act of 1867" and the "Nuisances Prevention Act, 1875" respectively, made by the Council of the Municipal District of Canterbury, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the above-cited Acts.

GEORGE R. DIBBS.

PART IV.

Streets and public places.—Public health and decency, &c.—Streets, &c.—Plans of proposed new road, &c., to be deposited.

1. Whenever any proprietor or proprietors of land within the said Municipal District shall open any road, street, way, park, or other place for public use or recreation, through or upon such land, and shall be desirous that the Council shall undertake the care and management of such road, street, way, or park, &c., he or they shall furnish the Council with a plan or plans signed by himself or themselves, showing clearly the position and extent of such road, street, way, or park, and if the Council shall determine to take charge of any such road, way, or other place as aforesaid, the plan or plans so signed as aforesaid shall be preserved as a record or records of the Council, and the proprietor or proprietors aforesaid shall execute such further instrument, dedicating such road, way, or other place to public use, as may be considered necessary by the Council, and such further instrument of dedication shall also be preserved as a record of the Council; but the Council shall not be compelled to take charge of, or spend money on, or vote money for, any new street, road, lane, or thoroughfare that is not forty feet wide including pathway, and unless such street, road, lane, thoroughfare, or other place is first proclaimed and properly formed and completed to the satisfaction of the Council, at the expense of the owner or owners of the land through which such road, street, lane, thoroughfare, or other place is carried.

Erection of houses, &c.

2. No person shall be permitted to erect any fence, house, shop, or other building in any street, lane, or place within the Municipal District, without first serving notice in writing on the Mayor or Council Clerk, stating such intention, and describing the proposed situation of the building or erection, and at the time the said notice is given, pay to the Council Clerk a fee of five shillings (for permission to erect any such house, fence, shop, or other building) and without having received an authority from the Mayor or Council Clerk. No person shall be at liberty to encroach beyond the building line in any street or lane, by the erection of verandahs, overhanging balconies, doorsteps, fences, or any other obstruction whatever. Any person offending against this By-law shall be liable to a fine of ten shillings; and in the case of an encroachment shall be liable to a further fine of not less than five shillings nor more than two pounds for every day that the same shall remain unremoved or unaltered, after receiving seven days' notice to that effect.

Committee of Works to fix street levels, &c.

3. The Committee for Works, or any officer or person acting under the supervision of such Committee, shall, subject to such orders as shall from time to time be made by the Council on that behalf, fix and lay out the levels of all public roads, streets, and ways within the Municipal District, and the carriage and foot-ways thereof, and it shall be the duty of such Committee, officer, or person, to place posts at the corners or intersections of any such public roads and streets, and of the carriage-ways and footways of such roads and streets, wherever the same may be considered necessary or desirable by the Council: Provided that there shall be no change of level in any such public road, street, or way until the same shall have been submitted to and adopted by the Council as hereinafter directed.

Change of street levels.

4. Whenever it may be deemed necessary to alter the level of any such public road, street, or way as aforesaid, the Committee for Works shall cause a plan and section showing the proposed cuttings to be exhibited at the Council Chamber for fourteen days, for the information and inspection of ratepayers, and shall notify by advertisement in some newspaper circulating in the Municipal District that such plan is so open to inspection. At a subsequent meeting of the Council the said plan and section shall, if adopted, be signed by the Mayor or Chairman, and countersigned by the Council Clerk; and such plan and section so signed and countersigned shall be a record of the Council.

Lights on obstructions, hoardings, &c

5. Any person who shall have caused building materials, or hoarding enclosing such building materials, or any obstruction whatever to be placed on any portion of the footway or roadway in any street or streets of this Municipal District, without having first obtained permission from the Council, and paid a fee of five shillings, shall for every day during which such materials, hoarding, or obstruction remains so placed, be liable to a penalty not exceeding five pounds nor less than one pound.

6. Any person in the last By-law mentioned who shall not cause such materials, hoarding, or obstructions, to be well and properly lighted with lamps burning from sunset to sunrise shall be liable to a penalty not exceeding five pounds nor less than one pound.

Lights on vehicles.

7. Every person whilst driving, leading, or riding upon any cart, carriage, wain, waggon, buggy, or other vehicle whatsoever, drawn by any horse. ass, mule, or other animal through any part of the Municipality between the hours of sunset and sunrise, shall carry a lighted lamp affixed in a conspicuous place on the off side of such cart, wain, waggon, buggy, or other vehicle, under a penalty of ten shillings for the first offence, and for every subsequent offence not less than one pound nor exceeding ten pounds.

No private sewers to be made to communicate with the public sewers without notice.

8. It shall not be lawful for any person, without notice to the Council, or otherwise than according to such plans and directions as such Council may make and give, to make or branch any private drain or sewer into any of the public drains or sewers, or into any drain or sewer communicating therewith; and in case any person or persons shall make or branch any private drain or sewer into any of the said public drains or sewers, or into any drain or sewer communicating or to communicate therewith, without such notice or otherwise than as aforesaid, every person so offending shall, for every such offence, on conviction forfeit and pay any sum not exceeding five pounds, and shall close such private drain under a further penalty of two pounds per week so long as such private drain remains.

Proprietors of private sewers, &c., to repair and cleanse same.

9. All drains or sewers communicating with any public drain or sewer shall, from time to time, be repaired and cleansed, under the inspection and direction of the Council, at the costs and charges of the occupiers of the houses, buildings, lands, and premises to which the said private sewers or drains shall respectively belong; and in case any person shall neglect to repair and cleanse or cause any such private drain or sewer to be repaired and cleansed, according to the direction of the said Council, he shall forfeit and pay for every such offence any sum not exceeding five pounds.

Drains for discharge of surface water from land.

10. Every owner or occupier of land in or adjoining to or near any street, if such land shall be so situated that surface or storm water from or upon the same shall overflow or shall tend naturally, if not otherwise discharged, to overflow any footway of such street, shall, within seven days next after the service of notice by the Council for that purpose, construct and lay from such point, upon such land being near to the footway, as shall be specified in such notice, by plan appended or otherwise, and higher in level than the bottom of the channel at the outer edge of the footway to the said channel, and through, under, and transversely to the footway, and keep in good condition such covered drain or trunk, as and subject to the inspection of the Council or its proper officers; and in default of compliance with any such notice within the period aforesaid, or with the provisions of this section, such owner or occupier shall forfeit any payment not exceeding five pounds. And if, within seven days after such conviction, such owner or occupier shall still have failed to comply with such notice, or be otherwise in default as aforesaid, he shall forfeit and pay any sum not less than one pound nor more than ten pounds, and for every such further offence he shall forfeit and pay any sum not less than two pounds nor more than twenty pounds; and every such owner or occupier who shall still have made default as aforesaid for more than seven days after such second or any future conviction shall be held guilty of a further offence within the meaning of this section.

Houses, &c., to be spouted.

11. All proprietors of houses within the Municipality having a frontage to any main thoroughfare shall be bound to have the same sufficiently spouted with down pipe, to be carried under the surface of the footpath into the gutter, under a penalty of ten shillings on conviction, and if not remedied at the expiration of seven days after such conviction, the offender shall be again liable to a like conviction and penalty also for every succeeding seven days.

No turf, gravel, &c., to be removed from streets without permission

12. Any person who shall form, dig, or open any drain or sewer, or remove, or cause to be removed, any turf, clay, sand, soil, gravel, stone, or other material in or from any part of the carriage or foot way of any street or other public place within the said Municipal District, without leave first had and obtained from the Council, or who shall wantonly break up or otherwise damage any such carriage or foot way, shall on conviction forfeit and pay for every such offence a sum not exceeding five pounds.

Holes to be enclosed.

13. Any person or persons who shall dig or make, or cause to be dug or made, any hole, or leave or cause to be left any hole adjoining or near to any street or public place within the said Municipal District, for the purpose of making any vault or the foundation of any house or other building, or for a well, or any other purpose whatsoever, and shall not forthwith enclose the same and keep the same enclosed in a good and sufficient manner to the satisfaction of the Committee of Works of the said Municipal District, on conviction shall forfeit and pay for every such refusal or neglect any sum not exceeding five pounds nor less than ten shillings.

Temporary stoppage of traffic for repairs, &c.

14. The Committee for Works, or any officer or person acting under the authority of such Committee, may at any time cause the traffic of any street, lane, or thoroughfare, or any portion thereof, to be stopped for the purpose of repairing the same or for any necessary purpose; and any person or persons offending against this By-law either by travelling on such street, lane, or thoroughfare, or by removing or destroying any obstruction that may be placed thereon for the purpose of suspending such traffic, shall forfeit and pay a penalty of any sum not exceeding five pounds nor less than ten shillings for every such offence.

Drawing or trailing timber, &c.

15. Any person who shall haul or draw, or cause to be hauled or drawn, upon any part of any street or public place within the said Municipal District, any timber, stone, or other thing otherwise than upon wheeled vehicles, or to drag or trail upon any part of such street or public place to the injury thereof, shall upon conviction forfeit and pay for every such offence a sum of not less than five shillings nor more than forty shillings over and above the damages occasioned thereby.

Throwing filth, &c , on footways, &c. -Killing animals.

16. Any person who shall throw, cast, or lay, or shall cause, permit, or suffer to be thrown, cast, or laid, or to remain, any ashes, rubbish, offal, dung, soil, dead animal, blood, or other filth or annoyance. or any matter or thing, in or upon the carriage way, footway, or water-table of any street, lane, or other public place in the said Municipal District, or shall kill any beast, swine, calf, sheep, lamb, or other animal, for the purpose of sale upon any premises other than licensed premises, shall on conviction forfeit and pay a fine not less than forty shillings nor more than five pounds.

Driving carriages, &c., on footways.

17. Any person who shall run, drive, draw, or cause, permit, or suffer to be run, driven, or drawn, upon any of the said footways of any such street or public place, any waggon, cart, dray, sledge, or other carriage, or any wheelbarrow, truck, or handbarrow, or any hogshead, cask, or barrel, or shall wilfully lead, drive. or ride, any horse, ass, mule, or other beast upon any such footway, shall upon conviction forfeit any pay for the first offence a sum not exceeding forty shillings nor less than ten shillings, for the second offence a sum not exceeding five pounds nor less than one pound, and for a third and every subsequent offence a sum not exceeding ten pounds nor less than two pounds for each such offence.

Placing carriages, goods. &c , on footways, &c.—Not removing when required.—Replacing the same after removal.—Not to prevent awnings being erected in front of shops.

18. Any person who shall set or place, or cause or permit to be set or placed, any stall-board, chopping-block, show-board (on hinges or otherwise) basketware, merchandise, casks, or goods of any kind whatsoever, in or upon or over any carriage or foot way in any street or public place within the said Municipal District, or shall place or cause to be placed any coach, cart, wain, waggon, dray, wheelbarrow, handbarrow, sledge, truck, or other carriage upon any carriage-way except for the necessary time of loading or unloading or taking up or setting down any fare, or waiting for passengers when actually hired, or harnessing or unharnessing the horse or other animals, or if any person shall set or place or cause to be placed on or upon or over any such carriage or foot way any timber, stones, bricks, lime, or other materials or things whatsoever, or shall hang out or expose, or shall cause or permit to be hung out or exposed, any meat or offal or other thing or matter whatsoever from any house or other building or premises over any part of any such footway or carriage way, or over any area of any house or other building or premises and shall not immediately and permanently remove all or any such matters or things being thereto required by the

Inspector of Nuisances or other proper officer of the Council, shall upon conviction for every such offence forfeit and pay for the first offence a sum not exceeding forty shillings nor less than five shillings, for the second offence a sum not exceeding five pounds nor less than ten shillings, and for a third and every subsequent offence a sum not exceeding ten pounds nor less than one pound.

Placards not to be affixed on walls, &c., without consent.

19. It shall not be lawful for any person to paste or otherwise affix any placard or other paper upon any wall, house, fence, or other erection, nor deface any such wall, house, fence, or erection, by chalk or paint, or in any other manner, unless with the consent of the owner thereof; and every person who shall be guilty of any such offence shall forfeit and pay a sum not exceeding twenty shillings nor less than five shillings.

Notices not to be painted on pavement.

20 Any person who shall stamp, stain, paint, write, or post any advertisement or notice upon any footway or kerb within this Municipal District shall be liable to a penalty not exceeding forty shillings.

Indecent placards.

21. Any person who shall in any street or place within this Municipal District, post, expose to view, distribute any placard, handbill, or other document whatever of an indecent character, shall be liable to a penalty not exceeding forty shillings.

Obstructing public pathways.

22. If the owner or occupier of any land situate on the side of any street or road in this Municipal District shall permit any tree, shrub, or plant kept for ornament or otherwise, to overhang any footpath or footway on the side of any such street or road, and on demand made by the Council shall not cut, lop, or cause to be lopped, all such trees, shrubs, or plants, to the height of eight feet at the least, the said Council, by their servants, labourers, and workmen, may cut or cause to be cut or lopped, at the expense of such owner or occupier, all such overhanging trees, plants, or shrubs, and to remove or burn any such trees, plants, or shrubs so cut or lopped without being deemed a trespasser or trespassers; and in case any person or persons shall resist or in any manner forcibly oppose the said Council or their servants, labourers, or workmen in the due execution of the powers given in this behalf by virtue of the "Municipalities Act of 1867," every person so offending shall on conviction, for every such offence forfeit and pay any sum not exceeding ten pounds not less than one pound.

Persons not to stand or loiter in streets.

23. All persons standing or loitering upon any of the footways or other public places in this Municipal District to the inconvenience of the passers-by, or in any way interrupting the traffic upon any of the said footways or places, and shall not discontinue to do so, on being requested by any officer or servant of the Council of this Municipal District, or any police officer, shall upon conviction forfeit and pay a penalty not exceeding five pounds nor less than one pound.

No rock to be blasted without notice to the Council Clerk.

24. Any person who shall be desirous of blasting any rock or earth within fifty yards of any road, street, public place, or dwelling shall give notice in writing twenty-four hours previously to the Council Clerk, who shall appoint a time when the same may take place, and give such other directions as he may deem necessary for the public safety on payment of a fee of five shillings; and if any person shall blast or cause to be blasted any rock or earth within the limits aforesaid without giving such notice, or shall not conform to the directions given to him by the Council Clerk, he shall on conviction forfeit and pay for every such offence any sum not less than one pound nor more than ten pounds.

Slop, night-soil, &c., to be conveyed away only at certain hours.

25. Any person or persons who shall drive or cause to be driven any cart or other carriage with any night-soil therein through or in any street or public place within the said Municipal District between the hours of five o'clock in the morning and ten o'clock at night; or shall fill any cart or other carriage so as to turn over or cast any night-soil, slop, mire, or channel dirt, or filth in or upon any such street or public place; or shall deposit night-soil or other offensive matter upon any street, road, or lane, or nearer to any street, road, or dwelling-house than shall be directed by the said Council or by the Inspector of Nuisances; or shall remove night-soil or other offensive matter otherwise than in properly covered and water-tight carts or other vehicles; or shall cause any cart or other carriage to convey or cart any night-soil or other filth within the said Municipal District, unless by permission of the said Council, or said Inspector of Nuisances; or shall cause any vehicle used for this purpose to stand on any premises nearer to any road, street, or dwelling-house than shall be directed by the said Council or the said Inspector of Nuisances, shall forfeit and pay for every such offence any sum not exceeding five pounds and in case the person so offending shall not be known to the said Council or Inspector, then the owner of such cart or carriage in which such night-soil or other offensive matter shall be put or placed, and also the employer of the person so offending, shall be liable to and forfeit and pay such penalty as aforesaid.

Riding on drays, careless driving, &c.

26. If the driver of any waggon, wain, cart, or dray of any kind shall ride upon any such carriage in any street as aforesaid, not having some person on foot to guide the same with reins, or if the driver of any carriage whatsoever shall wilfully be at such a distance from such a carriage, or in such a situation whilst it shall be passing upon such street that he cannot have the direction and government of the horse or horses, or by negligence or misbehaviour prevent, hinder, or interrupt the free passage of any carriage or person in or upon the said thoroughfare, every such driver or person so offending shall upon conviction forfeit and pay any sum not exceeding forty shillings.

Riding or driving furiously, &c.

27. Any person who shall ride or drive through or upon any street or public place within the said Municipal District so negligently, carelessly, or furiously that the safety of any other person shall or may be endangered, shall on conviction forfeit and pay a sum not exceeding ten pounds nor less than ten shillings.

Injuring or extinguishing lamps.

28. Any person who shall wantonly or maliciously break or injure any lamp or lamp-post, or extinguish any lamp set up for public convenience in the said Municipal District, shall, over and above the necessary expenses of repairing the injury committed, forfeit and pay for every such offence any sum not less than ten shillings nor more than five pounds.

As to damaging buildings.

29. Any person who shall damage any public building, toll-gate, toll-bar, toll-board, wall, parapet, fence, sluice, bridge, culvert, sewer, water course, or other public property within the said Municipal District, shall pay the cost of repairing the same, and if such damage be wilfully done shall forfeit and pay a sum not exceeding twenty pounds nor less than one pound.

Damaging trees.

30. Any person who shall wilfully and without the authority of the Council cut, break, bark, root-up, or otherwise destroy or damage the whole or any part of any tree, sapling, shrub, or underwood growing in or upon any street or place under the management of the Council shall on conviction forfeit and pay any sum not exceeding ten pounds nor less than one pound.

31. The Council shall have power to plant trees in the streets and public ways of this Municipal District, and any person wilfully injuring or destroying any of such trees, or any railing or fence protecting the same, shall on conviction forfeit and pay a penalty of not more than ten pounds nor less than two pounds, in addition to the value of the tree, railing, or fence, so injured or destroyed.

32. If any animal shall die in any part of the said Municipality and the owner of any such animal or the occupier of the place, if private property where such animal shall have died, shall not cause such animal to be immediately destroyed by fire, or so effectually removed and disposed of that no nuisance can possibly result therefrom in any part of the said Municipality, such owner or occupier shall for every such offence forfeit and pay any sum not exceeding two pounds nor less than ten shillings.

Indecent exposure of person.

33. Any individual who shall offend against decency by exposure of his or her person, in any street or public place within the said Municipality, or in the view thereof, shall on conviction forfeit and pay for every such offence any sum not exceeding ten pounds nor less than one pound.

Nuisances.

Dead animals not to be thrown into any public watercourse, &c.

34. Any person who shall cast any filth, rubbish, or any dead animal, or any animal with intent of drowning, into any public watercourse, sewer, or waterhole, or who shall suffer slops, suds, or filth of any kind to flow from his or her premises into any such watercourse or waterhole, or who shall permit or suffer any such slops, suds, or filth to flow from his or her premises over any of the footways or streets of the Municipal District, or who shall permit or cause, by means of pipes, shoots, channels, or other contrivances, filth of any kind whatsoever, to flow into any public watercourse, gutter, or waterhole, or who shall obstruct or divert from its channel and sewer, watercourse and creek, shall on conviction forfeit any sum not exceeding five pounds.

35. No kind of rubbish or offensive matter shall be thrown upon any public or private property within the Municipal District without permission first obtained from the Municipal Council, or in the case of private property from the owner or owners of such private property. Any person found guilty of a breach of this By-law shall forfeit and pay for every such offence any sum not exceeding two pounds nor less than ten shillings.

Swine not to be kept.

36. Any person who shall breed, feed, or keep any kind of swine in any house, building, yard, garden, or other hereditament situate and being in or within forty yards of any street or public place or any dwelling-house in the said Municipal District, shall on conviction forfeit and pay for every such offence a sum not exceeding forty shillings nor less than five shillings.

Stables, cow-sheds, and pigsties.

37. The occupier of any land within this Municipal District on which there shall be erected any stable, cow-yard, cattle-shed, or pigsty, shall cause such premises to be kept in such a state in respect of cleanliness as not to be a nuisance or injurious to health, and shall cause all dung, soil, or manure produced or accumulated thereon to be collected in a place (to be approved of by the Inspector of Nuisances) in the yard of such premises, and to be there in an inoffensive condition, and so as not to be productive of any nuisance, and shall cause such dung, soil, or other manure to be from time to time removed from such premises as often as the quantity of the same so collected or accumulated shall amount to two cubic yards; and if at any time the owner or occupier of any such premises shall neglect or fail to have such dung, soil, or other manure removed therefrom as aforesaid, the same may be removed by the Inspector of Nuisances at the expense of such occupier. Any person offending against any provision of this By-law shall for each offence be liable to a penalty of not less than one pound nor more than five pounds.

Deposit of rubbish, manure, &c.

38. No person shall deposit or cause or suffer to be deposited in or by the side of or on any road, street, right-of-way, lane, passage, water-channel, or gutter, or in any creek, or in any other public place within the Borough, any dust, mud, ashes, rubbish, filth, offal, manure, liquid manure, dung, soil, or other offensive matter; and no person shall deposit or cause or suffer to be deposited on any land, field, or garden, within the Municipal District, any night-soil, blood, offal, or other offensive matter or thing, without the written consent of the Mayor or Council; and any such offensive matter or thing which shall with such consent of the said Mayor or Council be so deposited shall be immediately, on the deposit thereof, covered over by the person depositing the same with such a quantity of earth as will at once prevent the escape of any noxious or offensive effluvium from any such manure, soil, blood, offal, or other offensive matter before mentioned: Provided that nothing contained in this By-law shall be so construed or taken to prevent the use as manure for any garden or land of the contents of any earth-closet or any other privy or closet where such contents are deposited on any such field or lane in a perfectly deodorized state and so as not to cause nuisance or offence either at the time of the deposit of such contents or afterwards. Any person offending against any of the provisions of this By-law shall be liable to a penalty of not less than two pounds nor more than ten pounds.

Cattle, &c., straying in the streets.

39. Any person who shall suffer any kind of swine, or any horse, ass, mule, sheep, goat, or other cattle belonging to him or her, or under his or her charge, to stray or go about or to be tethered or depastured in any such street or public place, shall on conviction forfeit and pay for every such offence a sum not exceeding forty shillings nor less than five shillings.

Privies, &c.

40. Any person who shall dig, form, or make any privy within fifteen feet of any dwelling-house, or within thirty feet of any well used for supplying any dwelling-house with water, shall on conviction forfeit and pay any sum not exceeding two pounds, nor less than five shillings, and if not removed within forty-eight hours after such conviction it shall be dealt with as a fresh offence.

As to private avenues, &c.

41. Any owner or occupier of any house, place, or land within the said Borough who shall neglect to keep clean all private avenues, passages, yards, and ways within the said premises, so as by such neglect to cause a nuisance by offensive smell or otherwise, or who shall allow stagnant water to become a nuisance on his land, shall on conviction forfeit and pay a sum not exceeding forty shillings for every such offence; and upon the reasonable complaint of any householder that the house, premises, yards, closets, or drains of the neighbouring or adjoining premises are a nuisance or offensive, the Inspector of Nuisances or any other person appointed by the Council shall make an inspection of the premises complained of, and the officer of the Council shall have full power, without any other authority than this By-law, to go upon such premises for the aforesaid purpose.

Cleansing butchers' shambles, slaughter-houses, &c.

42. It shall be lawful for the Inspector of Nuisances, or for any other officer or officers appointed by the Council, as often as he shall see occasion, to visit and inspect the butchers' shambles, slaughter-houses, boiling-down establishments, tanneries, and fellmongering establishments in the said Municipal District, and to give such directions concerning the cleansing the said shambles, slaughter-houses, tanneries, and establishments both within and without, as to him shall seem needful; and any owner or occupier of any such shamble, slaughter-house, tannery, or establishment who shall refuse or neglect to comply with such directions within a reasonable time shall forfeit and pay a sum not exceeding ten pounds nor less than one pound.

Placing dead animals on premises.

43. Any person who shall place or shall cause or suffer to be placed upon any land or premises within the Municipal District, any dead animal, blood, offal, night-soil, or any other offensive matter, so as to become a nuisance to the inhabitants thereof, shall on conviction suffer and pay a penalty not exceeding five pounds nor less than ten shillings for every such offence.

Allowing dead animals to remain on premises.

44. Any owner or occupier of any land or premises who shall suffer or permit any dead animal, blood, offal, night-soil, or any other offensive matter to remain upon the said land or premises after notice shall have been given to remove the same shall be subject to a penalty not exceeding two pounds nor less than ten shillings for every such offence for every day that the same shall so remain.

Bathing prohibited within certain limits.

45. Any person who shall bathe near to or within view of any inhabited house or of any bridge, street, road, or other place of public resort within the limits of the said Borough, between the hours of six o'clock in the morning and eight in the evening, shall on conviction forfeit and pay a sum not exceeding one pound for every such offence.

Various obstructions and annoyances.

46. Every person who in any street or other public place or passage within the said Municipal District, to the obstruction, annoyance, or danger of the residents or passengers, shall commit any of the following offences shall on conviction for any and every such offence forfeit and pay a penalty of not more than two pounds:—

Every person who shall hoist or cause to be hoisted or lower or cause to be lowered, goods of any description from any opening in any house fronting any street or public place and close to the footway thereof without sufficient and proper ropes and tackling.

Every person who shall erect, or allow to be erected, any flagstaff, sign-post, or pole of any kind, without having it at once attached to some other post or building so as to prevent its being blown down when it becomes decayed.

Every person who shall place any line or cord or pole across any street, lane, or passage, or hang or place clothes thereon to the danger or annoyance of any person.

Every person who shall place any flower-pot, box, or other thing in any upper window near to any street or public place without sufficiently guarding the same from being thrown down.

Every person who shall throw or cast from any roof or any part of any house or other building, any slate, brick, part of a brick, wood, rubbish, or other material or thing (unless within a hoard or enclosure, when any house or building is being erected, pulled down, or repaired).

Every person who shall, within the distance of one hundred yards from any dwelling-house, burn any rags, bones, cork, or any other offensive substance to the annoyance of any inhabitant.

Every person who shall carry goods or any frame, to the annoyance of any person, upon the footway of any street or other public footway.

Every person who shall be the keeper of or have any dog or other animal which shall attack or endanger the life or limb of any person who may have the right of way or use of any private yard, alley, street, or any other place within the said Municipal District.

Part V.

Noisome and offensive trades.

No noisome or offensive trade to be carried on to injury of any inhabitants.

1. No person shall carry on any manufacture or trade, in the conducting or carrying on of which, or from the premises where the same is carried on, any gas, vapour, or effluvia, or any large quantities of smoke shall be evolved or discharged, which shall be calculated to injure animal or vegetable life or in any other way to injure or be a nuisance to the inhabitants of the said Municipal District, and upon complaint in writing by any householder that any offensive trade is being so conducted or carried on in the vicinity of his or her residence or property as to injure his or her health or the health of any member of his or her family or to be a nuisance to such householder, the Inspector of Nuisances, or any other person or persons appointed by the Council, shall make an inspection of the premises where such trade is alleged to be so conducted or carried on as aforesaid and of the premises or property of the complainant, and shall inquire into the grounds for such complaint, and shall report thereon to the said Council. And if the said Council shall, on the consideration of such report or after any such further inquiry as may be deemed

necessary, be of opinion that the said complaint is well founded, notice shall be given to the person or persons conducting, following, or carrying on such trade to cease and discontinue the same within such reasonable time as the Council may direct. And if such trade shall not be discontinued as aforesaid or shall not be so conducted as that it shall wholly cease to be offensive within the time named in such notice as aforesaid, any person conducting or carrying on such trade as aforesaid, shall for the first offence forfeit and pay a sum not less than twenty shillings nor more than five pounds, for the second offence a sum of not less than two pounds nor more than twenty pounds, and for the third and every subsequent offence a sum of not less than five pounds nor more than fifty pounds.

Mode of proceeding when noisome and offensive trade is about to be commenced.—Penalty.

2. The like proceeding shall be taken as aforesaid whenever there shall be a complaint as aforesaid that any manufacture, trade, or operation is about to be commenced or entered upon which is likely to prove offensive within the meaning of these By-laws, save and except the notice to be given as aforesaid, shall be given to the person or persons about to commence or enter upon such manufacture, trade, or operation, and shall require him or her or them not to commence or enter upon the same, or to take such measures as shall effectually and permanently prevent the same from becoming offensive within the meaning of these By-laws to any resident within the said Borough. And any person who shall in any such case commence, enter upon, or continue any such manufacture, trade, or operation so that the same shall be in any way offensive within the meaning of these By-laws shall for every such offence forfeit and pay a sum of not less than two pounds nor more than twenty pounds.

Serving of notice.—Liabilities.

3. Service of any such notice as aforesaid upon the occupier or owner of any premises or land wherein or whereon any such manufacture, trade, or calling is being carried on or is about to be commenced or entered upon, or at the last known place of abode of such occupier or owner, or upon any person on the said premises or land, shall be a good and sufficient service of such notice for all the purposes of these By-laws. And every person who shall be actually engaged in superintending, directing, or managing, or who shall be in any other way actually engaged or employed in any such manufacture, trade, or operation as aforesaid, shall be liable to be regarded and treated as a person conducting, following, or carrying on such manufacture, trade, or operation within the meaning and for all the purposes of these By-laws.

Damming up water without consent.

4. Whosoever shall, without the consent in writing of the Council, construct or place any dam or embankment in or across any creek or natural watercourse shall forfeit and pay any sum not less than one pound nor more than twenty pounds, and shall remove such dam or embankment within a reasonable time after such conviction, or shall forfeit and pay any sum not less than five pounds nor more than fifty pounds. And if after such second conviction such person shall fail to remove such dam or embankment within a further reasonable time, he shall forfeit and pay a sum of not less than twenty pounds nor more than fifty pounds, and if within a reasonable time, after a third or any further conviction he shall still fail to remove such dam or embankment he shall for every such offence forfeit and pay a sum of fifty pounds.

Disposal of sewage, &c.

5. The Council shall have power from time to time to enforce the adoption or alteration of any system which to them may appear necessary for the better regulation, disposal, or treatment of night-soil, sewerage, or other drainage, and may suspend the use or further extension of any system which may to them seem detrimental to public health. Any person refusing or neglecting to comply with any requisition made under this By-law, after receiving notice from the Council or an officer under them, shall forfeit a sum not exceeding five pounds nor less than one pound for each offence, and also for every week during which such requisition shall remain uncomplied with.

Premises in a state to endanger public health.

Houses to be purified on the certificate of two medical practitioners.

6. If upon the certificate of any two duly qualified medical practitioners it appears to the Council that any house or part thereof or the premises occupied in connection therewith, within the limits of the said Municipal District, is in such a filthy or unwholesome condition that the health of any person is or may be liable to be affected or endangered thereby, and that the whitewashing, cleansing, or the purifying of any house or part thereof or the premises occupied in connection therewith would tend to prevent or check infectious or contagious disease, the said Council shall give notice in writing to the owner or occupier of such house or part thereof or the premises occupied in connection therewith to whitewash, cleanse, or purify the same as the case may require; and if the person to whom notice is so given shall fail to comply therewith within such time as shall be specified in the said notice, he shall be liable to a penalty not exceeding ten shillings for every day during which he continues to make default: Provided that no such penalties shall collectively amount to any greater sum than twenty pounds.

Making By-laws.

7. No By-law shall be passed until it has been reported upon by the By-law Committee.

Fines.

8. For every offence against the provisions of these By-laws, except as otherwise provided, the offender shall be liable to and shall pay a fine not exceeding five pounds nor less than five shillings, to be recovered as provided in the "Municipalities Act of 1867." And all other fines imposed by these By-laws, except as otherwise provided, shall also be recoverable as provided in the "Municipalities Act of 1867."

Amended By-laws.

Made by the Municipal Council of Canterbury, in accordance with the provisions of the "Nuisances Prevention Act of 1875."

1. On and after the first day of January, one thousand eight hundred and eighty-seven, no person or persons shall dig, make, or construct, or cause or permit to be dug, made, or constructed on any premises within the Municipality, any open closet or cesspit for the deposit of fœcal matter; and any person or persons offending against any of the provisions of this By-law shall be liable to a penalty not exceeding five pounds nor less than one pound.

2. No person shall cover up or cause or permit to be covered or filled up any existing cesspit with earth or other material unless and until the same shall be properly emptied and also inspected by the Inspector of Nuisances. Any person offending against this By-law shall be liable to a penalty not exceeding five pounds nor less than one pound.

3. A separate closet shall be provided for every tenement. In schools or factories where a number of person shall attend or be employed, separate closets with a door to fasten on the inside shall be provided for each sex, and a separate closet shall be provided for every twenty persons so attending or employed; where two or more closets adjoin each other there shall be a dividing wall between each to effect a complete separation; and any person offending against any of the provisions of this By-law shall incur a penalty not exceeding ten pounds nor less than two pounds for every week during which such provision shall not be complied with.

4. If in the opinion of the Inspector of Nuisances any alteration is required in existing cesspits or closets, he shall report the same to the Council, which shall determine what alteration is necessary for the preservation of health or decency, and such alteration shall forthwith be made by the owner of the premises, after receiving seven days' notice to that effect, under a penalty for every week's neglect or delay in effecting such alteration of not exceeding five pounds nor less than two pounds.

5. The owner or occupier of any house, building or passage, yard, earth-closet, or premises within this Municipality shall cause the same and every part thereof to be kept in a cleanly condition and so as not to be a nuisance or injurious to health.

6. If at any time the earth-closet in any premises shall overflow or become a nuisance, the owner or occupier shall be liable to a penalty not exceeding ten pounds.

7. No pan or bucket used as a receptacle in a dry earth-closet shall exceed in measurement more than one and a half cubic feet.

8. Any person desirous of having the Council's contractor to attend to their premises for the removal of refuse from a dry earth-closet must provide a galvanized iron pan or bucket to hold such refuse, with a handle across the top, and not of a larger capacity than to hold one and a half cubic feet.

9. The night-soil shall be removed by contract in properly constructed water-tight carts between such hours as the Council may determine, and the contractor will be held responsible for the careful conveyance of the night-soil to the appointed depôt, and shall dispose of the same by burying it in the earth at a sufficient depth, and covering the same with earth so as to prevent any nuisance arising therefrom, under a penalty for neglect not exceeding twenty pounds nor less than five pounds.

10. If the night-soil or any portion thereof shall be sold or given away by the Council, the person removing the same shall do so only at such times and in such manner as the Council may direct, and shall dispose of the same so as not to cause a public nuisance; and the person purchasing or obtaining it and so dealing with or disposing of it as to cause a nuisance shall be liable to a penalty not exceeding ten pounds nor less than two pounds.

11. The Inspector of Nuisances shall have power to visit and inspect any premises on any lawful day between the hours of 10 a.m. and 4 p.m., and any person refusing admittance or obstructing or hindering such inspector in the discharge of his duty shall incur a penalty not exceeding five pounds nor less than one pound.

12. The Council shall from time to time fix the charges to be made for emptying and removing night-soil from closets, which shall be emptied as often as may be necessary in the opinion of the Inspector of Nuisances.

13. No closet shall be erected or commence to be erected except in such place or position as shall be approved of by the Council or the Inspector of Nuisances; and any person being guilty of a breach of this By-law shall be liable to a penalty of not less than one pound nor more than five pounds for every day during which such erection shall remain.

14. When any new building is about to be constructed the builder or builders thereof shall first erect or cause to be erected on the premises a temporary closet not less than three feet by two feet six inches, for the use of workmen employed in the construction of the new building; and any person neglecting to conform to this By-law shall be liable to a penalty not exceeding five pounds nor less than one pound.

15. No person shall be permitted to connect any closet with any drain, watercourse, or sewer without the sanction of the Council. Any person so offending shall be liable to a penalty not exceeding twenty pounds nor less than five pounds.

16. Persons requiring their closets emptied shall send written notice to the Council or the Inspector of Nuisances; and any person wishing to use the refuse from dry earth-closets shall be at liberty to do so by making proper provision for emptying the same to the satisfaction of the Inspector of Nuisances; and any person causing a nuisance from the careless use of such closet or its contents shall be liable to a penalty not exceeding five pounds nor less than one pound.

17. No person shall use nor permit to be used, on the premises occupied or used by him or her, any night-soil which shall have been brought from any other premises unless written permission so to do shall have been first obtained from the Municipal Council or the Inspector of Nuisances of the Municipality; and any person offending against any of the provisions of this By-law shall be liable on conviction to a penalty of not less than two pounds nor more than five pounds.

18. The Inspector of Nuisances or other properly appointed officer of the Council shall have power to visit at all times all nightsoil depôts or places at which night-soil may be deposited, for the purpose of inspecting the same; and any person or persons interfering with, obstructing, or resisting the above-named officer in the execution of his duty shall be liable to a penalty not exceeding two pounds.

19. Written notice must be given to the Council or the Inspector of Nuisances by all persons about to construct new or alter existing closets, to enable the Inspector to visit and report on the same, under a penalty for neglect not exceeding five pounds nor less than one pound; and closets constructed without such notice being given must be removed or altered if judged necessary by the Council under a further penalty not exceeding two pounds nor less than five shillings for each and every day they may remain unremoved or unaltered after due notice to that effect.

20. The maximum penalty for a breach of any of these By-laws shall in each case be ten pounds and the minimum penalty one pound unless otherwise provided for.

Made and passed by the Council of the Municipal District of Canterbury, this twenty-third day of June, A.D, 1886.

(L.S.) JAMES SLOCOMBE,
Mayor.

H. M. INNES,
Council Clerk.

Sydney: Thomas Richards, Government Printer.—1886.

[9d.]

1885–6.

NEW SOUTH WALES.

PUBLIC VEHICLES REGULATION ACT OF 1873.

(AMENDED BY-LAWS.)

Presented to Parliament, pursuant to Act 36 Vic. No. 14, sec. 15.

Colonial Secretary's Office,
Sydney, 6th October, 1885.

METROPOLITAN TRANSIT COMMISSIONERS' AMENDED BY-LAWS.

THE following Amended By-Laws, made by the Metropolitan Transit Commissioners, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the provisions of the "Public Vehicles Regulation Act of 1873."

ALEX. STUART.

WHEREAS it is desirable to amend the By-Laws now in force for the regulating of Public Vehicles within the City and Police District of Sydney, the Board of Metropolitan Transit Commissioners do, under the authority vested in them by the "Public Vehicles Regulation Act of 1873," hereby make and establish the following By-Laws in lieu of By-Laws Nos. 7 and 15 now in force, and such By-Laws are hereby repealed.

Licenses shall be made out by the Registrar or his Assistants and numbered in such order as the Commissioners shall from time to time direct.

Every driver or conductor licensed under the said Act shall at the time of being employed by the owner of any licensed vehicle produce to such owner his license, and the owner of such vehicle at the time of employing every such driver or conductor shall demand the production of his license, such driver or conductor shall not lend or otherwise part with such license on any pretence whatsoever. No owner of any such vehicle shall employ an unlicensed person as the driver or conductor thereof.

Passed by the Board of Metropolitan Transit Commissioners this sixteenth day of September, in the year of our Lord one thousand eight hundred and eighty-five.

(L.S.)

THOMAS PLAYFAIR, Chairman.
EVAN JONES, Commissioner.
EDMUND FOSBERY, I.G.P., Commissioner.

W. J. MERRIMAN, Registrar.

1885.

NEW SOUTH WALES.

ROYAL COMMISSION—CONSERVATION OF WATER.

FIRST REPORT

OF THE

COMMISSIONERS.

SYDNEY: THOMAS RICHARDS, GOVERNMENT PRINTER.

1885.

118—*a* [933]

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SUMMARY OF MEETINGS OF COMMISSIONERS.

Number of Meetings held.	W. J. Lyne, President.	R. Barton.	J. B. Donkin.	F. A. Franklin.	F. B. Gipps.	R. L. Murray.	D. M'Mordie.	R. R. Machattie.	G. W. Townsend.	W. S. Targett.
Commission: Meetings to 10 Dec., 1885; number held, 99	57†	58	76	72	87	62	88	1	16‡	17§
*Sub-committee**: Meetings to 11 June, 1885; number held, 7	4	...	...	5	7	...	7	...	...	...

* Consisting of the President and Messrs. Franklin, Gipps, and M'Mordie.
† The President, on accepting office as Minister for Public Works, found it impossible to attend any further meetings of the Commission
‡ Left Sydney in September, 1884, in connection with Colo survey.
§ Appointed as a member of the Commission, May, 1885.

1885.

NEW SOUTH WALES.

ROYAL COMMISSION—CONSERVATION OF WATER.

FIRST REPORT OF THE COMMISSIONERS.

To His Excellency the Right Honorable Charles Robert, Baron Carrington, Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies, &c., &c., &c.

May it please your Excellency,—

We, your Commissioners, appointed on the 10th day of May, 1884, "to make a diligent and full inquiry into the best method of conserving the rainfall, and of searching for and developing the underground reservoirs supposed to exist in the interior of this Colony, and also into the practicability, by a general system of water conservation and distribution, of averting the disastrous consequences of the periodical droughts to which the Colony is from time to time subject," have the honor to submit this our First Report:—

Meetings.

We have held ninety-nine meetings, and examined 137 witnesses, minutes of whose evidence are appended.

Experience of other countries.

At the outset of our inquiry we caused letters to be sent to the Chief Secretaries of the Australian Colonies, the Governors of some of the Western States in the American Union, and, by the courtesy of your Excellency's predecessor, Lord Augustus Loftus, and the Foreign Office of the Imperial Government, to the Departments of European countries and the Presidencies of India in which works for the conservation and distribution of water have been carried out; and those communications have in a large measure placed at the service of this Colony a knowledge of the methods employed by other countries for the conservation and distribution of water and the experience which has been gained in respect to them. Much of this information is necessarily of a technical nature, having reference to constructive details; but many of the plans and other particulars with which we have been supplied will be found to be extremely valuable when similar works are entered upon in New South Wales.

Information from pastoralists and surveyors.

We have also sent circulars with skeleton county and parish maps to the whole of the Government surveyors, and to all the principal land-holders and other persons resident in different parts of the Colony from whom we had reason to hope information might be obtained respecting the watersheds of the districts in which they reside, the general fall of the surface, the flow of underground water, the number, position, and character of the wells, tanks, and dams, the amount of rainfall

and evaporation, irrigation where practised, and other information of the like nature. The number of circulars already issued is 560, and they have been accompanied by 5,040 maps. 108 answers have been received, and, as a great number of others are expected to come in, it is not possible to embody this information in the present Report. It is expected to be voluminous and important, and the information is being carefully compiled as it is received, and we anticipate that when the whole of the replies are received and tabulated, the accumulated experience and knowledge of pastoralists and others, scattered over a wide area, who have expended large sums in sinking wells and conserving water will be of great value in aiding future efforts for the discovery of underground supplies of water, and in indicating localities most suitable for the construction of storage works and distributing channels.

Engineer.

By the smallness of the appropriations made by Parliament for the purposes of the Commission, taken in connection with the fact that the services of surveyors and engineers employed under Government have not been available to the Commissioners, we have been precluded from undertaking an instrumental examination of the different catchment areas of the Colony, so essential for the proper consideration of water conservation and distribution to the best advantage; but it was nevertheless necessary that, in the prosecution of our inquiries, we should have the assistance of an Engineer, for the purpose of making flying surveys and reporting on particular points, and we accordingly selected a gentleman for that office.

Levels, gauges, river sections, and discharges.

Information as to the levels of different parts of the Colony existed in some of the Government offices, particularly in that of the Engineer-in-Chief for Railways; and it was one of the earliest duties of the Engineer to compile all known levels and to connect them with the river systems of the Colony. This has been so far completed as to give a fairly accurate idea of the slope of different parts of the Colony, and to show the directions in which canals or other distributaries may be practicable. He has also devoted attention to the ascertainment of accurate sections and discharges of the rivers Murray, Murrumbidgee, Macquarie, and Darling; the localities selected for the purpose being Albury, Dora Dora, Gundagai, Dubbo, Warren, Bourke, Brewarrina, and Walgett. Gauges have been fixed at all these places, and (with the exception of those at Dora Dora and Warren) they have been connected with the railway levels. The gauges are, therefore, now connected with sea level, and the foundation has been laid for the compilation upon uniform data of the discharges of the principal rivers—information which it is essentially necessary to procure before any large works for the storage and distribution of water can be safely entered upon.

Visits of the Commission to the country.

For the purpose of inspecting localities of proposed or possible works for water conservation, as well as to make ourselves better acquainted with the interior of the Colony, and to suit the convenience of important witnesses whose evidence we could not otherwise have obtained, we made the following tours:—

1st. To the Yanko and Colombo Creeks, taking evidence at Narrandera and Jerilderie on subjects specially referred to us by the Honorable the Colonial Secretary.

2nd. To Tamworth, Gunnedah, Narrabri, Walgett, Brewarrina, Bourke, Goonery Springs, Nyngan, and Dubbo, holding meetings and taking evidence at all these places in the order mentioned.

3rd. To Hay, Corrong Station, and Tupra Station.

In addition to these tours made by the Commission, we, on two occasions, deputed one of our number (Mr. F. B. Gipps, C.E.) to report on proposed sites of works for water conservation. The first of these visits of inspection was to the Namoi River, and the second to the Upper Murray. The reports of these inspections will be found in the Appendix.

Diversion of Snowy River into Murrumbidgee.

At an early sitting of the Commissioners, the Surveyor-General of this Colony stated in his evidence that he believed a large supply of water could be diverted from the Snowy River to supplement the discharge of the Murrumbidgee, and evidence was also obtained that water could probably be stored on the Upper Murrumbidgee

Murrumbidgee on an extensive scale, sufficient to assist materially in equalizing the flow in that river. In consequence of these opinions, we deputed a Surveyor to make an instrumental examination of the Tantangara basin on the Upper Murrumbidgee, and also to level from the Snowy River to the watershed between it and the Murrumbidgee. The Surveyor's report on the Tantangara basin, with our Engineer's remarks thereon, are included in the Appendix. The report on the levels in the Snowy River basin has not yet come to hand. Tantangara basin.

In this our First Report we have dealt with the questions submitted to us so far as the time and means at our disposal have permitted; but connected directly with the subject of our inquiry there are several very important points which we have not yet had an opportunity of investigating. Foremost among these are the terms on which an equitable settlement of intercolonial rights in the waters of the Murray River can be made. The Government of Victoria has for many years been collecting valuable statistics regarding the Murray and its tributaries in that Colony; but, excepting the records of the height of the Murray maintained by Mr. Russell, Government Astronomer, no corresponding information is available in New South Wales. It is highly desirable that a definite understanding on this subject should be arrived at as soon as possible, and with that end in view we propose to obtain the necessary data on which to base a satisfactory intercolonial agreement. To prepare the way for such an agreement we have arranged to confer with the Royal Commission on Water Supply in Victoria. Other points which merit full and careful inquiry, and to which we propose to devote our attention, are:— Subjects for future examination.

(*a*) The examination of the northern tributaries of the Darling, with special reference to the storage of flood-water in the upper portions of their basins, and to irrigation in the plains.

(*b*) A similar examination of the basins of our coastal rivers.

(*c*) The practicability of storing flood-water, on an extensive scale, in lakes and in all depressions of large capacity on the western plains, and in particular in the lakes near the Lower Darling and in Lakes Cargelligo and Urana.

(*d*) The problem of the underground supplies of water, especially as to their sources, direction of flow, and extent.

In addition to pursuing our inquiries on these subjects, we are prepared to deal promptly with the works for which surveys are herein recommended, provided the necessary funds are placed at our disposal.

For the systematic consideration of the subjects which have been included within the scope of our inquiry up to the present, as well as for the purpose of furnishing a comprehensive abstract of the evidence obtained, we have classed the various questions under the following heads:— Scope of present inquiry.

Under

Under the first head the general characteristics of the Colony are dealt with, and particularly those having an influence on the rainfall and on the available supply of water; while in the second, third, and fourth divisions, the amount of the rainfall and the proportion of it lost by evaporation and percolation are discussed.

In Parts 5 to 8 inclusive, the methods which have been, or can be, adopted for utilizing the available supply of water are described, and reference is made to the practice of other countries, especially in regard to irrigation.

The question of navigation is dealt with in Part 9, and its position and importance relatively to irrigation are briefly referred to.

Under the 10th heading we have divided the Colony into principal drainage basins and groups of drainage areas, and have calculated the area and the mean rainfall of each basin or group of basins. This arrangement enables us to place the information bearing on water conservation and supply, and especially that portion of the subject bearing on the rainfall, in a clear light and in a condensed form. With the aid of the rainfall returns of the Government Astronomer, the county and parish maps prepared by the Survey Department, and the evidence we have taken, the information regarding both the rainfall and the drainage area has been made as complete as possible, and is the closest approximation at present obtainable.

In the 11th division we have discussed the question of riparian rights, and have submitted a draft of the legislation which we recommend. This question is one of pressing importance, and one which must be dealt with before any national system of water conservation can be properly initiated. It will be seen that the main features of the proposed administrative machinery for developing water conservation and supply are—

(*a*) A permanent Board, acting directly under a Minister who will be able to devote a large portion of his attention to this and cognate questions; and

(*b*) The establishment of a system of local Trusts, which will generally construct and manage works for water conservation and supply.

Under the 12th heading, the conclusions arrived at by the Commission on subjects other than legislation are embodied in a series of recommendations.

(1.) PHYSICAL FEATURES.

Great Dividing Range.

The Great Dividing Range, trending, roughly speaking, almost parallel with the coast, forms the principal watershed of the Colony; and, with the spurs which run out from its eastern and western slopes, determines the direction of surface flow. The Muniong and the Snowy Ranges, in the southern portion of the Colony, are the only mountains upon which snow rests for any considerable time; and although snow-storms occasionally visit Ben Lomond and the higher altitudes of the range, they are not of sufficient frequency and the quantity of snow precipitated is not large enough to form any very important factor in estimating the sources of water supply. The Murray, the Murrumbidgee, and the Snowy River are the only streams whose volume is augmented to any considerable extent by the melting of the snow, and these all take their rise in the Snowy Mountains. The loftiest peaks in Australia occur in this part of the country, and their summits are more than 7,000 feet above sea-level, and double the height of the Great Dividing Range viewed as a whole.

Coast rivers.

The rain-clouds which come from the Pacific Ocean with the east and south-east winds strike the shoulders of the eastern slopes of the Dividing Range, when the rain is precipitated and often flows down their steep slopes in torrents, and is carried to the sea by the Moruya, Clyde, Shoalhaven, Hawkesbury, Hunter, Manning, Hastings, Macleay, Clarence, Richmond, and other rivers. The coast district, embracing an area of 50,000 square miles, whose western boundary is the summit of the mountains, and running back from the sea to distances varying from 30 to

150 miles, has a heavier and more regular rainfall than that of the country west of the Dividing Range.

Western waters.

The spurs which run out upon the western face of the main range, although not so precipitous as on its eastern declivity, are nevertheless sufficiently bold to direct the flow of water into well-defined channels for short distances from their base; nearly all, with the exception of the Lachlan (whose general course resembles that of the Darling), trending for a long distance of their flow in a north-westerly direction until they unite with the Barwon or the Darling, whose sluggish and tortuous course south-westerly and south lies through wide-reaching plains of level and for the most part rich country. The principal tributaries of the Darling are the Macintyre, the Gwydir, the Namoi, the Castlereagh, the Macquarie, and the Bogan, each in its turn being fed by numerous creeks and the whole outflow of the western watershed (including the Murrumbidgee and the Murray) converges upon Wentworth, whence it flows west and south to the sea near Adelaide. The area and principal facts respecting the different basins, in so far as information has been available, will be referred to further on when we come to consider the characteristics and capabilities of particular districts for water storage.

Transcontinental range.

Mr. C. S. Wilkinson (the Geological Surveyor) and other geologists are of opinion that at some earlier epoch there existed a dividing range of primary rocks running nearly at right angles with the coast range, and he has traced it across from the Flinders Range in South Australia to Wilcannia, curving round to Cobar, Parkes, and Orange, so that it forms the watershed between this portion of the Darling and Lachlan basins. The rocks forming the roots of this range may be traced near the surface, and Mount Murchison is regarded as portion of the range which, by denudation, has in the lapse of ages now almost wholly disappeared.

Cretaceous basin.

The country to the north of this lost range, on to the Gulf of Carpentaria and perhaps Port Darwin, is supposed by geologists to have been submerged by the sea at one time as a deep basin, and that its present condition is due partially to upheaval and partially to the enormous denudation of the mountain chains of Australia. From these premises deductions have been drawn having an important bearing upon the probable existence of underground water which will call for further reference.

Lakes.

If we except lakes which are estuaries of the sea, such as Lake Macquarie, the principal lakes of New South Wales are shallow, and are also untrustworthy in regard to the permanency of their supply. In many cases they are merely large depressions connected with rivers, and depending for their supply on occasional floods in those rivers. Lake George, situated on the eastern side of the dividing range, and at an elevation of about 2,200 feet above the sea, is the best known, and one of the most important of the lakes of the Colony. In dimensions it is about 19 miles by 6, and is supplied from several intermittent creeks, but has no outlet. As might be expected under these circumstances, the water in the lake is strongly impregnated with salts. Lake George has been known to fail entirely, as also has Lake Bathurst, ordinarily about 15 miles in circumference, situate in the same district, and its bed to be dry for considerable periods; but these lakes have never been known to overflow. Of the other lakes of the Colony the most important are Yantara, Cobham, and Salt Lakes, near the extreme north-west of the Colony; Poopelloe, Pamamaroo, Menindie, Cawndilla, and Tandou Lakes, along the course of the Darling; Lake Victoria, near the Lower Murray, Cowal Lake and Lake Cargelligo, which are fed from the Lachlan, and the Narran Lake, in which the river of the same name is lost. There are many other lakes of less importance but similar in their description to those mentioned. Of the lakes situated near the course of the Lower Darling there are three having each an area of more than 60 square miles. The great capacity of these lakes is evidenced by the fact that when rapid falls in the Darling occur, it is estimated by the captains of the river steamers that the outflow from the lakes to the Darling keeps that river navigable for ten days or a fortnight longer than it otherwise would be. This is an important point, especially when it is considered that the outlets from the Darling to the lakes are in their natural state, and that, with few exceptions, no attempt has been made either to increase the supply flowing into the lakes or to regulate the outflow. In the case of the lakes east of the Darling, in the

county

county of Livingstone, an almost permanent supply is maintained, through the construction of a dam across the Tallywalka Creek. This was done by the lessees at their own expense, the cost amounting to £3,000 or £4,000; and, as stated by Mr. Mair, "the effect of that dam was to throw the water into a series of lakes extending north and south a distance of 80 miles, and I should think giving several hundred miles of almost permanent water frontage." The figures stated by Mr. Mair show at a glance the remarkably profitable character of the dam referred to. "Several hundred miles of almost permanent water frontage," acquired at an expense of "£3,000 or £4,000," is a statement which requires no comment.

Cowal Lake. Lake Cargelligo.

Cowal Lake and Lake Cargelligo occupy with regard to the Lachlan a position similar to that occupied by the Menindie and other lakes with reference to the Darling; Lake Cargelligo, with its area of 11½ square miles, presenting unusual facilities for storing large supplies of flood-water. Special surveys to ascertain what can be done in this respect have been made under the direction of Mr. Adams, Surveyor-General, and with most encouraging results. The question has not escaped the notice of the lessees of the land surrounding the lake, as they have constructed a dam on the creek leading from the lake to the river Lachlan, and by that means they retain a large portion of the flood-water. The improvement of this dam, and the construction of sluice-gates in it, as suggested by Mr. Moriarty, Engineer-in-Chief for Harbours and Rivers, would produce very beneficial effects at a very moderate expense.

Lake Urana.

Cowal Lake and Lake Urana, though large in point of area, scarcely deserve the name of lakes, as they are merely shallow depressions, which obtain an uncertain supply from occasional floods. Surveys may, however, show that they are capable of being very much improved.

Lake Yantara. Cobham Lake.

The lakes in the extreme north-west of the Colony, Lake Yantara and Cobham Lake in particular, have large catchment areas; and from their position, in a very dry district, remote from any permanent river, must be looked on as possessed of very considerable importance. Before the heavy rain of January last Cobham Lake was almost, if not quite, dry, but after the flood of that month there was a sheet of water 8 miles in length, and in some places as much as 27 feet in depth.

Facilities for canals.

The general configuration of the country, as exemplified in its mountain system, is so well known that a detailed description of the great barrier, whose elevation varies from 2,000 to upwards of 7,000 feet, seems unnecessary; but the rise and fall of the country westward is not, perhaps, so commonly understood. The levels of the country lying between the Murray and the Murrumbidgee show that it is singularly well adapted for the construction of canals, and the capabilities of its soil for agricultural production can hardly be surpassed. Over a large portion of the area there is a gentle inclination north-west from the Murray, and south-west from the Murrumbidgee, and our investigations justify the expectation that water from these rivers can be led over a large portion of its surface. The country between the Lachlan and the Murrumbidgee is more irregular; but the enormous area lying between the Lachlan and the Darling, which appears as a blank in the general maps of the Colony, has been ascertained to possess some well-defined features. So level is the southern portion of this area that there is every reason to believe water may be conducted through the whole of it, in fact in high floods the waters of the Lachlan and the Darling—ordinarily separated by an interval of 200 miles—have spread out to within a distance of about 30 miles of each other. North of the Willandra Billabong there are depressions wherein there is reason to hope considerable bodies of water may be stored in this arid region; but the information available, which at present is very limited in extent, does not disclose any specially favourable features in the contour of the country for distributing channels. North of the Bogan, and west of the Great Dividing Range, the country is irregular until it leaves the spurs from the range; but the fall thence to the Darling is remarkably uniform, and offers great facilities for the distribution of water through artificial channels.

Levels: Newcastle to Walgett.

Starting at only 2 feet above high-water-mark at Newcastle, the Great Northern Railway runs up the valley of the Hunter, and is carried over the Liverpool Range,

Range, at an elevation of 2,070 feet; it then descends at the rate of 85 feet per mile for 8 miles, and at the rate of nearly 40 feet per mile until Werris Creek is reached, at an elevation of 1,245 feet. Taking a north-westerly course across the basin of one of the principal tributaries of the Namoi, the level falls 371 feet in the first 41 miles, the elevation at Gunnedah being 874 feet, and 177 feet in the 46 miles to Narrabri, where it is 697 feet. From Breeza to a point 70 miles north-west of Narrabri, following the line of railway survey, the fall of the country, with few and unimportant exceptions, is 3 feet per mile, the distance being 152 miles; thence to Walgett, 43 miles, at the junction of the Namoi and the Barwon, the fall is scarcely 15 inches per mile.

Sydney to Bourke.

The configuration of the country between Sydney and Bourke is seen from an examination of the railway levels between those termini. Starting at Sydney at 64 feet above the sea the Great Western Line crosses the Valley of the Nepean at about 90 feet, and reaches the summit of the Main Range at the Clarence siding, at an elevation of 3,658 feet. Descending the spurs of the western slope into the valley of the Macquarie, Bathurst is passed at an elevation of 2,153 feet, and in the next 40 miles it ascends nearly 700 feet to a point near Orange, from which locality the descent to the western plains begins. Dubbo, 278 miles from Sydney, is situate on the eastern margin of the plains, and its elevation is 865 feet. Beyond Dubbo there are some low ridges and slight undulations, which influence the grades considerably over short lengths, but for the whole distance (225 miles) to Bourke the fall is remarkably steady, averaging about $2\frac{1}{4}$ feet per mile. The valley of the Macquarie is first crossed at 145 miles from Sydney, the watershed dividing the Macquarie from the Lachlan at 186 miles, the valley of the Macquarie again at distances of 248 and 278 miles, and the Bogan, at Nyngan, at 377 miles. Between Dubbo and Nyngan there is a mean fall of about 3 feet per mile. The first of the low ridges which occur beyond Nyngan is at 397 miles, and its elevation at the place crossed is 622 feet, the lowest ground between that point and Nyngan being at 546 feet above sea-level. Girilambone, at 405 miles, is situate on the next ridge, its elevation being 639 feet; and of the series of ridges which follow, the highest is 781 feet, at 414 miles. Cobar Road, 424 miles, marks another ridge of 747 feet, and in the next 8 miles there is a fall of 170 feet, or more than 21 feet per mile; the next 23 miles shows a fall at the rate of 4 feet per mile, and the next 46 miles about 18 inches per mile. The black-soil country begins near this point, and the surface is very level on to Bourke, but with a slight fall-away from the river, the elevation at 491 miles being 343 feet, while that at Bourke (503 miles) is 346 feet.

Bourke to Mount Brown.

No levels by an instrumental examination of the country beyond the Darling have been obtained, but a section prepared by the Superintendent of Drills goes to show that there is an undulating rise from the Darling to the Mount Brown Range. This range is shown as having an elevation of more than 1,000 feet above sea-level, becoming gradually lower and less defined as it extends south. The range appears to trend west of south until it passes into South Australia. The fall of the country north-west of the Darling to that river is so slight that no water except in times of heavy rain would reach it.

Wallerawang to Walgett.

The country along the route of the railway proposed to be constructed from Mudgee to Walgett (428 feet) resembles in its general character that along the line to Bourke. The railway line from Wallerawang to Mudgee follows as far as Ilford the course of the Dividing Range, which here recedes further from the coast than at almost any other point. The respective elevations at Wallerawang, Ilford, and Mudgee are 2,928, 2,450, and 1,635 feet. The levels of the survey between Mudgee and Walgett show to within 40 miles of Coonamble an undulating country, whose average elevation ranges between 1,100 and 1,200 feet. The ridge between the Talbragar and the Castlereagh would be crossed at an elevation of 1,660 feet, and another ridge 41 miles to the northward at 1,560 feet. The plain country begins at a point distant from Sydney 293 miles and to the south of Coonamble 40 miles. It falls with gentle undulations for 10 miles to a level of 918 feet, and the fall for the next 30 miles to Coonamble is a fairly regular one of 11 feet per mile. The fall for the first 15 miles beyond Coonamble is at the rate of about $3\frac{1}{2}$ feet per mile, and thence on to Walgett (66 miles) it is slightly over 1 foot per mile.

The

Dubbo to Coonamble.

The surveys made between Dubbo and Coonamble show that the country is higher and more ridgy than on the opposite side of the Macquarie. While at Dubbo the elevation is 865 feet, at 28 miles from Dubbo in the direction of Coonamble it is 1,100 feet; 9 miles of undulating country brings the level down at Marthaguy Creek to the same as Dubbo, and from the creek to Coonamble there is a fairly regular fall of a little more than 6 feet per mile.

Between Bourke and Walgett.

Comparing the line from Dubbo to Bourke with the surveys from Dubbo to Walgett and Coonamble, it will be seen that while on the former the plains begin at or slightly to the west of Dubbo, on the last-named route the undulating country goes to about 39 miles north of Dubbo. The levels also go to show that while the fall of the rivers is towards the north-west, there is also in this part of the Colony a fall in the land towards the south-west.

Nyngan to Cobar.

Nyngan is situate on the east bank of the Bogan, at an elevation of only a few feet above the flood-level of that river. 58 miles to the west the railway surveys show that the line to Cobar will have to be taken across a ridge at an elevation of 1,045 feet above sea-level, or 473 feet above Nyngan and 255 feet above Cobar. The position of this ridge corresponds with that of the mountain chain described by the Government Geologist as one which probably formed the southern coast-line of the ocean whose waters in the cretaceous period covered most of the area now lying northwards to the Gulf of Carpentaria and Port Darwin. Comparing the levels at Cobar with those of the portion of the survey which has been made between Condoblin and Wilcannia, it is found that the former are about 450 feet higher than the latter. Cobar appears to be on the side of the range referred to, while the line from Condoblin follows the low undulating country about 130 miles to the south and south-west.

Forbes to Wilcannia.

The Forbes to Wilcannia route, from Condoblin to the north-west, shows an irregular succession of undulations until the top of the Guagong Range is reached, the pass through which is lower than Condoblin, the respective heights being 660 feet and 618 feet. In the county of Blaxland the country continues ridgy, but there is still a fall in a southerly and in a westerly direction. Booberoy Creek which, like the Willandra Billabong, is an effluent from the Lachlan, is crossed at 36 miles from Condoblin, and at an elevation of 530 feet. Passing beyond the branches of the creek there is a gradual ascent to the top of a ridge which is crossed at an elevation of 654 feet, and at a distance of 70 miles from Condoblin. The route for the next 164 miles is through an undulating incline to the north-west, the height above sea-level at that point (234 miles beyond Condobolin) being 264 feet, and for the remaining distance (35 miles) to Wilcannia the surveyed line extends through plains country. Along the first 234 miles from Condoblin to Wilcannia many extensive depressions are met with, several of which appear to become marshes or lakes after heavy rains, and some of which could probably be utilized for the storage of large supplies of water. After passing the Guagong Range, 28 miles from Condoblin, there is every reason to believe that in the undulating country extending from that place to within 35 miles of the Darling, no portion of the rainfall ever reaches either that river or the Lachlan. A large proportion of the plains country is subject to inundation, particularly after crossing the first ana-branch of the Darling, at a distance of 22 miles from Wilcannia.

Liverpool to Wentworth.

Skirting the valley of George's River and crossing that of the Nepean, the Great Southern Line ascends the Dividing Range to Mittagong from which place to Breadalbane it traverses the table-land, whose elevation varies from 2,000 to 2,300 feet above the sea. This plateau constitutes an important portion of the gathering ground for the Shoalhaven River and its tributaries in the south, and for the Wollondilly and its tributaries on the north. Beyond Bredalbane there is a descent through hilly country, and in the catchment area of the Lachlan till the basin of the Murrumbidgee is reached near Yass, where the country is still hilly, the elevation at Yass being 1,657 feet. Beyond this point the gathering ground of the Murrumbidgee is traversed, but at only a short distance from the watershed between that river and the Lachlan. At Junee the elevation is 985 feet, and thence to the Murrumbidgee at Narrandera the country may be classed as undulating, but with a fall of nearly 7 feet

per

per mile. From Narrandera to Hay the course of the river is followed along open plains having a mean fall of 2½ feet per mile. The height above sea-level at Hay is 305 feet, while that at the junction of the Murrumbidgee with the Murray is about 190 feet, which gives a fall in a direct line of about 15 inches per mile. From the junction of the Murray and Murrumbidgee to Wentworth the fall is only 70 feet, while the direct distance is about 85 miles.

(2.) RAINFALL.

Causes of abnormal rainfall.

The quantity of rain which falls in any given locality depends on many circumstances, chief among which are temperature, distance from the ocean, configuration of the country, and position relatively to prevailing winds. Concurrence of several favouring causes produce abnormally high rainfall, while concurrent absence of such causes will have the reverse effect. Thus, at Cherra Pungi, on the Lower Himalayas, the mean annual rainfall during the years 1859 and 1860 reached the enormous amount of 615 inches. There the vapour-laden clouds carried by the south-west monsoons from the Bay of Bengal strike the mountains at an elevation of 4,500 feet and discharge their contents in torrents of rain. On the other hand, in that portion of Central Asia extending along the northern side of the Himalayas rain is almost unknown. For the week ending 18th June, 1885, the rain-gauge at Yowai (33 miles due east of Cherra Pungi) registered a fall of 64·79 inches, of which 51½ inches fell in forty-eight hours. Although 40 inches in twenty-four hours have been measured at Cherra Pungi, it is believed that 50 inches in two days is higher than any previous rainfall on record. In one of the islands of the Hawaiian group rain is said to fall every day on one side of the mountain, while it is alleged that rain has never been known to fall on the other.

Rain records.

Parliament made provision for the establishment of the Observatory in the year 1856, but, although meteorological science has a most important bearing on the prosperity of the Colony, it was not until the appointment of Mr. H. C. Russell, B.A., to the office of Government Astronomer, in 1870, that any systematic effort was made to collect information of the rainfall of New South Wales, and its great progress since then is mainly due to his labours. Finding only five observing stations in existence, he at once took steps to add others—with what success may be seen from the fact that the number of observers who sent in statistics of rain measures during 1884 was 496. Notwithstanding the importance which is now attached to the subject, a map of Australia would show nearly one-half of its area a total blank (if the overland telegraph line be excepted), so far as meteorology is concerned; and data based upon observations made over a much wider field than that which has yet been occupied will have to be accumulated before the course of storms can be accurately traced, or generalizations affecting the rainfall of the continent can be safely made.

Decrease of annual mean.

The fact that the Astronomer's records of rainfall came from only five observers in 1870, and that until 1878 Mr. Russell had very great difficulty in enlisting co-operation of others in this department of his work, seems to justify the opinion that the average of recorded rainfall for those years would be extremely fallacious if taken as the average of the rainfall of the Colony for the same period, or if looked upon as anything more than the most approximately accurate mean obtainable of that of the coast district. Indeed, the only method of obtaining useful practical results from the rainfall observations, as far as water conservation is concerned, is to ascertain the mean rainfall as nearly as possible in each river basin. This has now been done, and the results are stated in connection with the various drainage areas.

Cause of apparent decrease of rainfall.

With the exception of the years 1878 and 1879, the latter of which was phenomenally wet, the averages of the years since 1874 disclose an almost uniformly regular decrease in the rainfall. This is no doubt partly attributable to the series of very dry years which have proved so disastrous to the principal producing interests of the Colony.

Colony. A diminished rainfall of 50 per cent. has at times desolated particular districts, but the records of the Astronomer have proved that droughts are not of equal severity throughout the Colony—that while one part of the country suffers from a diminished rainfall other parts have an average supply, and others again may be favoured with an abundant fall. As the "dry" districts occupy a far larger area than those which may be regarded as humid, and as the quantity of rainfall there is of more pressing importance, it is not surprising that the number of observing stations in the former is much greater than that in the latter. A glance at the rainfall map of 1878—the first year in which it was published—shows that observing stations were then few, and widely separated throughout the Colony, to the west of the Main Range; while in that for the year 1884, that portion of the Colony, in common with the coast districts, was thickly studded with collectors of meteorological statistics. Rain from thunder-storms is often extremely local. It was found on a single run, where six rain-gauges were kept in various parts of it, that the record of the rainfall ranged from 19·81 inches to 27·75 inches.

Coast districts. An idea of the rainfall along the coast may be formed from the records of the following observing stations, the first column showing the mean rainfall for each year during which records have been kept, the second showing the average number of rainy days, and the third the number of years of which the preceding columns are the average :—

	Mean rainfall. Inches.	Wet days.	Years in mean.
Eden	35·78	115	14
Sydney	49·61	163	14
Port Macquarie	60·59	131	14
Clarence Heads	45·06	87	8
Antony	63·85	155	4

Table-land. The like information applicable to the following stations on the table-land is :—

	Mean rainfall. Inches.	Wet days.	Years in mean.
Tenterfield	29·99	72	14
Armidale	29·76	78	14
Tamworth	25·64	69	7
Mount Victoria	36·65	89	12
Goulburn	25·84	87	14
Cooma	18·38	78	14
Kiandra	61·16	103	6

Darling. Records from the following stations on the Darling show these results :—

	Mean rainfall. Inches.	Wet days.	Years in mean.
Walgett	15·76	40	5
Brewarrina	20·04	...	12
Bourke	16·01	42	10
Louth	11·40	30	4
Menindie	7·37	33	4
Wentworth	11·14	70	14

Rain sections. Commencing on the coast, and following as nearly as possible the parallels of latitude, there is, as a rule, a steady decrease in the rainfall. This is exemplified in the case of the three lines passing in this manner from the coast towards the western boundary of the Colony through the following stations :—

A.

Name of Station.	Approximate distance from the coast.	Mean annual rainfall.	Mean number of rainy days.	Number of years reckoned.	Remarks
	miles	inches			
Clarence Heads	0	45·06	87	8	
Grafton...	20	33·57	81	13	
Glen Innes	96	33·03	104	3	
Myall Creek	160	27·18	78	6	
Dungalear	300	15·08	31	4	
Warraweena	420	14·93	32	8	
Nocoleche	540	12·19	39	6	
Mount Poole	680	7·13	20	6	

B.

B.

Name of Station	Approximate distance from the coast.	Mean annual rainfall.	Mean number of rainy days.	Number of years reckoned.	Remarks.
Sydney	0	49·61	163	14	
Carcoar	120	26·14	79	3	
Lake Cowal	220	13·97	47	5	
Naradhan	280	17·15	47	5	Probably influenced by the Cocoparra Range.
Culpotaro	400	12·35	42	6	
Lake Victoria	560	9·50	27	3	

C.

Cape Saint George	0	51·67	108	14	
Queanbeyan	60	22·56	70	14	
Wagga Wagga...	150	22·12	74	13	
Wangonilla	300	14·20	45	7	
Murray Downs...	370	15·58	51	14	

New South Wales compared with other countries

The rainfall of New South Wales as compared with some other countries does not support the idea of those who regard this Colony as peculiarly arid; and it could be shown that droughts, which are the great scourge of the country, are common to almost every part of the habitable globe. It is true that the diminished rainfall is not so disastrous in its consequences in more temperate climates as it is in Australia; but the meteorological records of England show that during the period between 1740 and 1750 there was only 71 per cent. of the average rainfall. In some parts of Europe—Sweden, and Russia—the rainfall is as low as 15 inches per annum; the average for twenty-years at Marseilles was 12·8 inches, and at Alicante the total for the year has fallen as low as 7·1 inches. In so exceptionally favoured a country as Great Britain the distribution in different parts is very unequal, the average falling as low as 20 to 28 inches on the east, and running up to 75 inches in the Lake districts. The precipitation of rain is in many countries more immediately caused by the existence of mountain ranges which intercept the rain-clouds as they are swept up from the sea. The rain-bearing winds from the Bay of Bengal pass over the wide tract of swampy plains, and striking the Himalayas near Darjiling discharge their contents in torrents along the face of the mountains, while the south-west monsoon deluges the Western Ghats with from 100 to 250 inches in a year, the fall in each case becoming less inland as the clouds are exhausted of their moisture. Cape Colony, whose climate and physical features greatly resemble that of New South Wales, has a heavy rainfall precipitated on its eastern slopes by the winds which blow from the Indian Ocean; and, while the rainfall of the Colony as a whole is reported to be 24 inches, the average declines to about 12 inches in the western districts. This is much the same as that which occurs in the more remote interior of New South Wales and Queensland and in the northern areas of Victoria, the rain clouds in each Colony being largely intercepted by the mountain ranges. The mean rainfall in the southern portion of South Australia, where there are no high coast ranges to arrest the drift of the clouds, is as low as 20 inches at Adelaide, and 8 inches at Port Augusta at the head of Spencer's Gulf. California is a country which for the larger portion of its area is extremely arid and its rainfall intermittent, periods of heavy flood and extreme drought alternating with each other. During the interval from 1850 to 1872, the yearly rainfall at San Francisco ranged from 7·4 inches to 49·27. On the coast to the north of San Francisco the rainfall becomes heavy, while to the south, at San Diego, it diminishes to 10 inches, and at Fort Yuma it is little more than 3 inches. In some districts, however, abundant supplies of artesian water have been discovered; and on the summits of the Sierra Nevada they have a snow-field to draw upon, of which the only approach to a counterpart in New South Wales is the Snowy Mountains.

The

Rain-winds.

The rainfall of the Colony is brought chiefly by the winds which come from the south-east and east. Much of the rain with which they are charged is precipitated in the coast district or on the eastern slopes of the main range. The moisture which remains in the clouds after they have passed the summits of the mountains falls in quantities which diminish almost in direct proportion to the distance from the range. This rule is, however, correct only within certain limits, which can be plainly traced in Mr. Russell's rainfall map. On referring to this map, it will be observed that in passing towards the north-west of the Colony the rainfall diminishes, till the district bordering on the Darling is reached, and that not only does the diminution cease there, but there seems to be a slight increase towards the Queensland border. This is due to the fact that the heaviest rains in that part of the Colony come from the north-west, and that they diminish in their south-easterly course, till the supply of moisture finally becomes exhausted. The cause of the great rain-storms which traverse a large portion of the Colony from north-west to south-east is not well understood, owing to the want of a sufficient number of observing stations in Queensland and in South Australia.

Influence of forests on rainfall.

An opinion which has obtained some acceptance is that the rainfall of different parts of the globe is to a great extent modified and determined by the forests; and a large body of facts has been collected in reference to India, Spain, the Mauritius, and elsewhere, to show that the denudation of the forests has diminished the rainfall, and caused in large measure the sterility of certain tracts of country. This generalization appears to have had its origin in a deduction by Humboldt, who, when travelling in South America, observed that in a district where trees had been cut down the waters of the lake dried up, and that after the growth of the semi-tropical vegetation indigenous to the region the bed of the lake again became filled with water. Mr. Russell, however, brings indisputable evidence to show that the waters of Lake George, which, when moderately full, is 20 miles long and 7 miles wide, was dry in 1836, and was for a short time used as a cattle and sheep run, and that the drying up of the immense body of water which it had before contained could not by any possibility be attributed to the cutting down of trees. The reason in each case was a decrease in the rainfall affecting the whole world. He regards the trees as the result of the rain, and not rain as the result of the trees. On the other hand, the Government Astronomer of this Colony points to the rain records of England from 1726 to 1882, to those of France, extending back to 1688—to those of the United States of America, for a period of sixty-six years—and to those of this Colony for forty-three years—all of which show an increase, not a decrease, in the rainfall, notwithstanding the enormous amount of forest destruction which has taken place. And American observations show that the magnificent forests which extend from Minnesota to Maine have a rainfall identical with that of the nearly treeless plains which extend westward of Chicago.

Effect of ring-barking on surface flow.

While the information regarding the effect of forests on rainfall is as a rule indefinite and contradictory, the question of the effect of eucalyptus forests on surface drainage seems to be practically settled. In a paper read before the Royal Society of New South Wales, by Mr. W. E. Abbott, in 1880, the result of ring-barking forests of eucalyptus in the Hunter River district was shown to afford conclusive evidence that such forests in their natural state have a remarkable effect in stopping the flow of surface water. In the instances quoted by Mr. Abbott, three creeks which before the ring-barking was done were dry excepting after unusual rainfall, became permanent running streams. As pointed out in the paper referred to, the eucalyptus has obtained the reputation of being possessed of exceptional capabilities for absorbing water, and it has in consequence been successfully used as a means of draining swampy ground. These capabilities for absorbing moisture are strikingly shown by the gaugings which Mr. Abbott made of the supply in the creeks mentioned. After the trees had been killed, the supply flowing at ordinary times was found to be 26½ gallons per minute, while after heavy rains the quantity was too great to admit of its being gauged by the means available. In the same paper attention is called to a report by Mr. Draper, of the New York Observatory, in which it is maintained that

" neither

"neither the rainfall nor the temperature of the Atlantic States of America has altered in any appreciable degree within the last century," though "these are the States in which, during the last century, a larger amount of deforestation has been done than in any other part of the world." Mr. Draper also investigated the records of the rainfall of Paris for a period of 190 years, and "found on examining them that during that time there had been a slight increase in the rainfall, not steadily, but in oscillations extending over long periods."

Effect of forests on temperature.

While there appears ample proof that forests have no appreciable effect on the rainfall, it is beyond question that they have a moderating effect on the temperature. This has been well illustrated in the case of two places in the Punjab Plains, situated at a distance of 18 miles apart, one in open country and the other in a dense forest. It is found that in the hot season the temperature at the latter is generally 6° or 8° lower than at the former.

Use of forests in preserving soil from erosion.

An important use of trees and shrubs is in preventing the erosion of the soil in hilly places by floods. The pernicious effect of completely clearing the ground of trees in hilly country when the soil is deep can be studied in the Colony at no great distance from Sydney, and in some countries the absence of trees is in this manner a source of great national loss. Moncrieff says that in Spain "the whole country is furrowed by rivers running in deep beds and fed by natural drainage lines scored over its surface, and generally dry. The slopes, entirely devoid of vegetation, can offer no resistance to the eroding action of the water, and possess no means of retaining the moisture. So, the rain-storm over, the torrents run for a few days in flood and return to their extreme dryness." The wholesale denudation of forests in mountainous country will almost inevitably be followed by the washing down of the surface soil wherever it is broken up for cultivation, and the propriety of imposing restrictions upon ring-barking on lands so situate may well engage the attention of the Government.

Other uses of forests.

The effect of forests upon rainfall is totally distinct from the question of their immense importance to the health of communities, their great value in preserving the soil of mountainous country from denudation, and their uses in the industrial arts.

Influence of conserved water upon rainfall.

It was expected that the construction of large works for the storage and distribution of water in Italy would have had an appreciable effect in increasing the humidity of the atmosphere, but experience has not confirmed that view. The impression appears to be general that the climate of the interior may be ameliorated by evaporation from an extensive water surface, and it is thought that in the course of years the rainfall may be sensibly increased by the enlargement of water storage from year to year. Several observers have noticed that thunder-storms appear to be deflected by creeks, even in such perfectly level country as the Darling, and that the rain which falls along the course of such depressions is greater than that in other parts of the district.

(3.) EVAPORATION.

Experiments by the Government Astronomer.

From the systematic observations which the Government Astronomer has initiated, it may be expected that the amount of evaporation in different parts of the Colony will be ascertained with a close approximation to accuracy, but in the present state of knowledge upon the subject opinions vary considerably. Thus, many pastoralists have written to the Astronomer to say that in the hottest months of the summer evaporation goes on at the rate of 1 foot per month for three or four months, while others do not think that it amounts to more than 3 or 4 feet for the whole year. The Assistant Engineer for Roads, who is charged with the construction of tanks, thinks that from a tank containing 18 feet of water evaporation would not exceed 4 or 5 feet (Q. 1571). It has been stated in our inquiries that at Gurley, in the Gwydir

Gwydir district, 2,000 sheep were watered for considerably more than a year from a tank 10 feet deep, and there was water in it then, although none had run in the whole time. One witness, speaking of a swamp near the north-western boundary of the Colony, into which the water brought down from Queensland by the Bulla River flows, says that the average depth of the lake was 4 feet, and that the water lasted fifteen months, when it disappeared from evaporation and soakage. (Q. 3087.) The conditions upon which observations are made, though in the main similar as to temperature and permeability of soil over large areas in the western districts, are nevertheless sufficiently dissimilar in different localities to account for any discrepancy in estimates of evaporation of the whole of the north-western districts based upon observations applicable to a particular spot or to a very limited area. Hot winds, which are of comparatively rare occurrence in the coast districts (being generally underlain by the sea breeze), and which range in temperature at Sydney from 80° to 106°, are more frequent on the western plains, where the thermometer sometimes records 130°, and for days together stands at 110° to 116°. It would be a mistake, however, to attribute this condition of wind to long periods, for the wind records show that, as compared with the coast districts, those beyond the Main Dividing Range have a comparatively tranquil atmosphere.

Evaporation under ordinary conditions.

In the course of the Government Astronomer's experiments he found that the evaporation from grass was from one and a half to two and a half times greater than that from water, and that the evaporation from soil destitute of vegetation was from two to three and a half times greater than from water. The evaporation from a water surface at Albury was at an average rate of more than 4 inches per month for the six months October to March, and nearly 7 inches a month for the two months of December and January.

Circumstances on which evaporation depends.

The amount of evaporation depends on several circumstances, prominent among which are the temperature, the winds, and the nature of the surface from which the evaporation takes place. It has been found that evaporation is affected in an important degree by the temperature of the water acted upon, as well as by the temperature of the atmosphere. Thus, for example, in the case of the Ganges Canal, which is fed largely by snow-water, the evaporation at Roorkee, 18 miles from the head works, was found to be only one-tenth of an inch per diem, while at a distance of 52½ miles from the head works it was more than one-seventh of an inch per diem. With a hot wind blowing incessantly, the maximum evaporation from still water at Roorkee was found to be half an inch in twenty-four hours. In the Madras Presidency it was found by Major Mayne, R.E., that the mean evaporation from a reservoir 1,375 acres in extent was 0·165 of an inch in twenty-four hours, or 60 inches per annum. In the Bombay Presidency the evaporation has been ascertained to be 72 inches per annum.

Testing arrangements made by Mr. Russell.

We proposed, soon after the inception of our inquiry, to establish a series of observing stations, with a view to ascertain the amount of evaporation in different districts, but we found that the Government Astronomer was making arrangements for the same purpose, and we did not therefore deem it expedient to proceed further in the matter. Mr. Russell wrote:—

> Parliament having voted money for me to make experiments upon evaporation, I had arranged to carry out these at places where I have observers, viz., Bourke, Menindie, Wentworth, Hay, Albury, Young, Euabalong, Dubbo, and Lake George, and at such of the public tanks as have caretakers of sufficient intelligence to make the observations. The tanks I proposed to use are generally similar to the one in use for so many years here, viz., 4 feet diameter and 3 feet deep, made of galvanized iron, and provided with a screw gauge showing loss of water in thousandths of an inch. I desired to include Cobar, Wilcannia, and Milparinka, if observers could be obtained. As the money is only recently available, I have only taken preliminary steps in this matter, and should be willing to modify the proposals as far as possible to meet the wishes of the Commission. I would like to point out that it must take some years to get data from these experiments such as will be useful in computation, and perhaps what has been already done may serve for present use. Mr. Todd, in the dry climate of Adelaide, finds the evaporation from a tank 4 feet over, and sunk in the ground 66 inches per annum. (Rainfall 21 inches, not much more than Bourke). In Melbourne (rainfall 25 inches) under similar circumstances it is found to be 48 inches, and in Sydney 32 inches.

Since

Since writing the above Mr. Russell has had evaporation tanks placed at a number of the stations mentioned, and has obtained the following returns:— Tank evaporation.

Evaporation Table—Result of Observations with the Tank Evaporation.

Month.	Bourke.	Hay.	Hillston.	Remarks.
	inches	inches	inches	
March	1·579	.....	.....	Observations commenced on 23 March
April	4·770	.....	.....	
May	3·037	.....	.....	
June	2·858	.....	.....	
July	1·637	.....	.....	
August	3·793	2·762	2,074	Observations at Hillston began on 13th
September	3·975	2·736	3,280	
October	7·559	.....	.....	

Mr. W. E. Abbott estimates the area of Narran Lake or, more correctly speaking, of the two lakes which constitute what is commonly known as Narran Water, at 35,000 acres. This appears to be the area when the lake is full or nearly so. Assuming that the average area of the surface from which evaporation would take place during the whole year would be about 20,000 acres, it is an important question what quantity of water would pass off by evaporation alone. Supposing that the evaporation would be at the rate of 6 feet per annum, the quantity which would during the year be evaporated from every acre of the exposed surface would be 261,360 cubic feet. This would be equivalent to a rate of nearly half a cubic foot per minute per acre, or to nearly 166 cubic feet per second over the entire area. If it be assumed that the Narran flows only three months in the year, it would require to give a supply of 664 cubic feet per second during that period to make up the amount which would pass off by evaporation. Mr. Abbott mentions that for some distance before it reaches the lake the Narran has a width of about 40 yards. Assuming this width, it appears that, merely to supply the estimated amount evaporated, the river at the inlet with a mean velocity of 1½ feet a second must have a mean depth of 3 feet 9 inches if flowing for three months in the year. The Narran is very irregular in its flow, and it seems highly improbable that such a large supply as 489 cubic feet per second would pass down to the lake for three months continuously. If the assumed period of flow be shortened, a greater depth and a larger volume of water would be required in the river to meet the call of evaporation. With regard to the large supply which is said to flow into the Narran in times of flood, the great capacity of the lake affords a ready explanation for the fact that no water flows out again. Taking the total area of the lake as stated by Mr. Abbott, namely, 35,000 acres, and supposing a flood to occur when the lake is empty, or nearly so, a very simple calculation shows that if the mean depth of the lake be 10 feet, it will require a flow of 4,000 cubic feet per second for forty-four days to fill the lake. This would be equal to a river 120 feet wide and nearly 17 feet deep, flowing with a velocity of 2 feet per second. It will thus be seen that, after allowing for evaporation, there can be comparatively very little water left to be accounted for by soakage to the underground strata. The Narran is a type of several other intermittent streams, particularly those flowing southwards from Queensland. Narran Lakes.

Evaporation from a broad, shallow depression such as the Narran Lake is much greater in proportion to the water surface exposed than from tanks such as are commonly excavated for stock purposes. This is due to three causes. In the first place the larger surface affords greater scope for the action of the wind. The second cause is the extent to which the temperature of shallow water is affected by the sun's rays. The third cause is due to the action of capillary attraction in maintaining a strip of land around the lake in a state of saturation. This last is a point which is frequently overlooked, though it is one of great importance, especially when it is considered in the light of Mr. Russell's experiments already referred to on the relative rates of evaporation from a water surface and from earth. Evaporation from shallow depressions.

Early

Lake George.

Early in the present year the Government Astronomer had a self-registering evaporation gauge placed in Lake George. The primary object in fixing the gauge there was to ascertain the evaporation from such a large body of water, the conditions at that lake being very favourable for such an investigation. The following tabular statement is a summary of the results obtained:—

Date.	Evaporation.		Rainfall.	Total loss by Evaporation.	
	Reading of gauge.	Loss.			
1885.	inches.	inches.	inches.	Months of	
March 1	2·8	.....	.....	.....	
April 1	6·8	4·0	0·44	4·44	March.
May 1	7·7	0·9	1·54	2·44	April.
June 1	8·8	1·1	1·92	3·03	May (very windy).
July 1	6·7	2·1 gain.	3·42	1·32	June.
August 1...	5·0	1·7 loss.	1·82	0·12	July.
September 1	5·4	0·4	1·06	1·46	August.
October 1	7·9	2·5	1·15	3·65	September.
October 31	10·7	2·8	1·74	4.54	October.
8 months	.....	7·9	13·09	20·99	

In connection with this table the Government Astronomer adds the following explanatory note:—

It will be observed that I have added only the rain which fell on the lake, taking the mean of two rain gauges, one at each end. That is, I have assumed that no water runs from the hills into the lake, but I have done so because the gauge shows the rise in the lake when the heaviest rain fell to be only equal to the measured rainfall. For instance, on the 12th June the rain measured was 1·02, and the lake rose just 1 inch. I have no record of the state of the creeks leading to the lake, but it may be stated that the rains have been very light and the season dry, so that it is not likely much, if any, would run after an inch rainfall in one day—the heaviest record.

Mr. Russell also writes:—

During the last fourteen years the lake has lost by evaporation 12 feet, and in May, 1878, the railway survey carried down the western side showed that the lake was then 6 feet below its 1871 level, or 2,225 feet above the sea. It appears, therefore, that in seven years, 1871 to 1878, the lake lost 6 feet; and again, from May, 1878, to February, 1885, say seven years, the lake again lost 6 feet by evaporation; and this of course in addition to all the rain which fell during that period. Taking the records at Goulburn and Gungahleen, near the lake, the average rainfall for the first seven years was 27·95 inches, and during the next seven years 23·68 inches. One would expect to find more evaporation during the dry years, but this is not borne out by observations. From the rainfall and recorded evaporation, the lake therefore lost by evaporation at least 3 feet per annum. I say at least, because some rain-water must have run into the lake in addition to that which fell into it directly, but its amount cannot be determined. In future the recording-gauge will determine this, and perhaps then we may apply the experience gained to estimating how much ran in during the last fourteen years. That the gauge will serve this purpose is proved by what it has already done. On March 11th a strong northerly wind came on, and in three days the lake lost by evaporation 1½ inch. On April 14th and 15th 1·10 inch rain fell, with a strong wind, and by the 17th the lake had lost all the rain by evaporation, and was at the same level as on the 13th. On the other hand, in calm or almost calm weather three and even four days pass without any loss by evaporation. It should be stated that the rain on 14th and 15th April, though 1·70 inch fell at Douglass, only 0·77 fell at the north end of the lake, and the rise in the water due to it was 1½ inch, so that it would appear but little of that rain-water came down the hills into the lake.

The evaporation on the lake on a windy day shows to what extent the wind affects it. No doubt its effect on a large body of water is much greater than on a small one, because on the lake in calm weather the lower air must get to a certain extent saturated with moisture, and there being no wind to carry it away, evaporation practically ceases; but where small quantities of water are placed to test evaporation, there are abundant means for the evaporated water to get away in the surrounding air which is not saturated. Evidence is accumulating that the evaporation from large tanks is not so great as has been supposed. The heat is no doubt very great, but the total absence of wind in the interior for considerable periods is obviously, from what has been shown, an important condition for the saving of water. At Bourke recently I was very much struck with the absence of wind, especially on the surface of the ground, and the self-registering anemometer which I erected there in March last bears important and measurable testimony on this point. The recording parts are so easily moved that they work satisfactorily with a velocity of 1 mile per hour. Taking the total number of miles of wind recorded at Bourke by an anemometer placed 25 feet above the ground during thirty days, I find it is 2,350 miles, or about 78 miles a day only. The strongest wind

wind in that period shows 50 miles of wind in 5½ hours, and the smallest record for a day is 25 miles, little more than a mile per hour. In Sydney during the same period 7,050 miles of wind were recorded, and it is not uncommon to record in Sydney in three days as much wind as was recorded in Bourke in thirty days.

(4.) SUBTERRANEAN WATER.

Flow from surface.

The quantity of rain-water which will flow off the surface into the rivers depends upon the extent of the rainfall and the slope and character of the surface; and as these vary in different localities and at different seasons, it is obvious that no general rule can be applicable. It may be stated generally that the proportion varies from 0 to 75 per cent. It has been found that in the upper portion of the river Garonne the proportion is 65 per cent., and in the case of the Po, 75 per cent. The discharge of the Seine is equal to only 23½ per cent. of the rainfall, while in the case of other rivers it is only from 10 to 15 per cent. The proportion which is drained off by the streams in the San Joaquin Valley is about one-third. A large proportion of the heavy rain which is precipitated upon the steep declivities and impermeable strata of the Great Dividing Range may be expected to flow into the rivers, while very little of that which falls upon the porous surface soil of the plains which extend on either side of the Darling would drain off the level land. The flooded land in that district has been known to extend for a distance of 70 miles across, and there are parts so flat that when the whole ground is covered by water it is often impossible to detect any current. Where the trampling of sheep takes place in lines which follow the general fall of the country, it will be found that the water will collect into channels and be conducted to the rivers. When it is borne in mind that the average quantity of rain at Bourke during eleven years has been only 16·18 inches per annum, and that the average number of days in each year upon which rain fell was forty-two, it will probably be apparent that much of the rain comes in such very fine showers as would be insufficient to create any flow, and that when, after the lapse of long intervals of dry weather, heavy rain does fall, the numerous gaping fissures which traverse the plains absorb a large proportion of it. A case is mentioned (*Evidence*, p. 85) where a torrent, such as a horse could not safely cross, descended from the Wanarang Mountains for forty-eight hours, and was nearly all absorbed by the open ground. Similar facts have been noticed in various parts of the Colony. Little more than 9½ inches (9·67) of rain is recorded to have fallen at Bourke during 1884, and this small quantity was distributed over thirty-six days. The heaviest fall for any month was 1·43 inches, and the only months in which the rainfall exceeded 1 inch were April (1·10), May (1·30), June (1·43), September (1·12), and December (1·37). It must be apparent that the discharge into the Darling in the locality of Bourke must have been so small as not to be measurable. A contrast to this condition of circumstances may be found in the measured discharge of the Nepean and Cataract Rivers, which is found to be about 44 per cent. of the total rainfall. Mr. Russell computes the discharge of the Murray for 1883 at 36 per cent., and for 1884 at 25 per cent.

Subterranean flow.

Refering to the supplies of water which have been struck by miners beneath the basalt at Cope's Creek and other mining centres, the Principal Government Geologist states that these deep leads are old river channels, which have been filled up by sand, clays, and basalt, and that they carry the underground drainage of the country. Their course is westerly, and they must continue right to the plains. He has seen evidence of these subterranean river beds all along the flanks of the Dividing Range. At irregular intervals great tracts of basalt are to be found. The lava has flowed down and filled up some of the old valleys, and now forms the floor of portion of the plains, so that we cannot indicate exactly under the plains where the leads occur. All that is known is, that the old drainage system which was in existence prior to the basaltic outbursts has been covered up by lava in some places. He also states that the western limit of the basaltic outbursts may be described approximately by a line drawn from Albury to where the 149th meridian crosses the Macintyre River. He is therefore of opinion that much of the water which falls between the

western summits of the Dividing Range and that line flows under the surface. The evidence given before us in reference to the Namoi, the Macquarie, and other rivers, also corroborates the theory that there is a considerable amount of percolation. We defer more specific reference to other facts bearing upon this part of the subject until we come to direct attention to the drainage areas of the different rivers and the more salient facts which have come to our knowledge respecting them.

Supposed outlet to the sea.

Supposing the amount of percolation to be as great as he estimates from the data at his command, Mr. Russell is of opinion that the underground drainage must flow to the sea; for, on the assumption that there was no outlet to the ocean, no extent of subterranean storage for water which is conceivable as existing could hold the vast accumulations which it is supposed has for ages been flowing downwards. In whichever direction the subterranean water may be supposed to flow, it must percolate through several hundred miles of strata. The mud springs found in some places in the west of this Colony tend to show that such underground flow exists; but the evidence furnished by these mud springs, and also by wells and borings, though both interesting and valuable, is too fragmentary in its character to enable us to arrive at definite conclusions regarding the source or the extent of the underground supplies. The base of the denuded range extending from Orange to South Australia, through or near Cobar and Wilcannia, would naturally have the effect of diverting the course of underground streams from the north, and to some extent those from the north-east.

Underground flow near Mount Gambier.

At Question 963 the Government Geologist expresses the opinion that the miocene formation of which he was speaking collects the underground drainage of the Barrier Range, and that it is quite possible that it extends to the coast of Victoria and South Australia. "We cannot," he says, "tell how far it does really extend to the south, but I have no doubt that the underground water escapes into the ocean. That is proved by the underground channels which exist in the Mount Gambier district, where the water at some places is said to run at the rate of 4 or 5 miles per hour. This being limestone formation, it is easily dissolved by the underground currents, and thus channels have been formed." Subsequently he states his opinion that the underground rivers near Mount Gambier, flowing in the direction of the ocean, which is not far distant, drain an immense area of country south of the Barrier Range.

Lakes in South Australia.

By the courtesy of the South Australian Water Conservation Department, we have obtained the report of the Government Geologist of that Colony on the lakes of the Mount Gambier district. The Blue Lake, whose average diameter is about half a mile, is enclosed within steep banks of 150 to 300 feet. Its surface level is about 70 feet below the town of Mount Gambier; the average depth of the lake is from 200 to 250 feet, and the bed of the lake about 190 feet below sea-level. Other lakes to the westward of Blue Lake appear to be connected with it. The Government Geologist (Mr. H. Y. L. Brown) states in this report that the low temperature of the water in the Mount Gambier lakes is against the theory of its being derived from any deep-seated source in connection with volcanoes. "Their principal supply is doubtless derived from the same source as the other underground water wherewith the tertiary beds of the south-east are charged, namely, from the watershed of the Murray, Darling, &c." It appears to us, however, that the available information is insufficient to show that the underground channels near Mount Gambier derive their supplies, or any considerable portion of them, from rain falling in this Colony.

Flow from Gawler Ranges.

Mr. Russell Barton, M.P., mentions that in South Australia, between the coast and the Gawler Ranges, people can tell exactly the depth at which an inexhaustible supply of water can be found. "To my knowledge," he states, "if you sink a well at a time of heavy rain in this country the water will rush down it, bringing with it all sorts of rubbish and débris, and within ten minutes of the stoppage of that rush the water becomes perfectly clear, and remains exactly at the same height in the well. Endeavours have been made to reduce the depth of the water by means of pumps and other appliances, but it cannot be lowered a quarter of an inch. These wells may be found at intervals for a distance of 300 or 400 miles down the coast."

The

The same may be said of a remarkable well at Sale, in Victoria. When water was first struck in that well it came up quite black with leaves, rubbish, and dead timber, showing that it must have entered the soil through openings on the surface sufficiently large to allow a great deal of water to pass into the earth otherwise than by percolation, or else that the strata in which the water was tapped contained great quantities of trees and other vegetable remains. The flow of water in that condition to the surface continued for several days, and an enormous quantity of rubbish was brought up from the well. Sale is in the immediate neighbourhood of two deep and constantly flowing rivers (the Thomson and the Latrobe), and within sight of the Australian Alps, which have a rainfall of not less than 50 inches per annum. Artesian flow at Sale, Victoria.

We have very briefly referred to the opinions which the Geological Surveyor in charge has formed of the strata of the north-western districts; but the important bearing which they have upon the question of underground water storage demands more than a passing allusion. The denuded mountain range whose outcrop has been traced from Orange to Cobar, Wilcannia, thence westerly into South Australia, marks the southern shore of what is considered to have been a portion of an ocean, which at the same period probably covered the entire northern portion of Australia. By a process of oscillation the bed of the ocean was gradually upheaved, and the southern portion of the continent at a late period depressed. By the upheaval of the ocean's bed on the northern portion of Australia the cretaceous formation which occurs in this Colony north and west of Cobar was brought nearer to the surface; and the miocene marine deposits extending southwards from the Barrier Ranges to the sea were lifted up at a later period. Bearing of geological formation on theory of underground flow.

The cretaceous formations of this Colony, so far as they have been explored, are estimated to cover an area of about 40,000 square miles, and are generally overlaid by beds of clay formed by the compression of soil washed down from the mountains. The rocks and gravel brought down by the mountain torrents would by reason of their greater specific gravity settle for the most part along the flanks of the ranges, and in the course of strong currents, while the finer particles of soil held in solution would be carried further out. Water in cretaceous formation.

The tendency of watercourses flowing through deltas is to silt up. It is no uncommon thing for the banks and sometimes even the beds of rivers flowing through deltas to be higher than the adjacent plains; and in consequence of obstructions to their flow to cut new channels for themselves. These phenomena, so familiar to all who are acquainted with the rivers of Australia, which have their course through flat country, show what has been going on for ages; and hence, no doubt, it is that the lines of drift and gravel which remain to show the course of the drainage in former periods are found at various depths. Silting up of watercourses.

The series of lakes which appear upon the maps of South Australia are situated on the margin of the cretaceous basin. In the N.E. Lakes, Frome, Blanche, Gregory, and others, the dry beds are generally incrusted with salt. There has been a period, long passed, when the flood-waters of the Cooper flowed into them down the Strzelecki Valley. It seems probable, however, that a slight upheaval in the vicinity of the lakes has altered the respective levels, and now, perhaps only once in five years, the Cooper overflows into the Strzelecki, and these waters flowing for about a month seldom reach beyond the south end of Lake Blanche, when they become salt and quickly dry up. South Australian lakes.

The dip of the cretaceous basin is northwards; but, if it were otherwise, the only outlet for the drainage would be the break in the transcontinental range which occurs near Wilcannia, known as the Darling Gap. The Government Geologist says that the break in the formations is only 5 miles across, and he is of opinion that the depression there is very shallow. (Q. 944.) The strata to the south of this gap is, moreover, impermeable. While therefore it is probable that this gap may have served to drain off some of the water from the northern sea after the upheaval of its bed, and before the miocene beds to the south of it were lifted up, it is also probable that if there Darling Gap.

there were now any underground flow through the Darling Gap, the fact would be made apparent by springs or flowing water on the surface in the locality, where after passing through the Gap its further progress southward would be arrested by the impermeable strata.

Water discovered below sea-level.

Water has been found at Tarkanina, in South Australia, 150 miles from the western boundary of this Colony in latitude 29° at a depth of 1,220 feet, or 1,040 feet below the sea-level, and it rose 20 feet above the surface; while at Hergott Springs, also in South Australia, the water was struck at a depth of 339 feet, or 193 feet below sea-level. It flows over the tubes at a height of 65 feet above the surface, and will probably rise higher if tubed. In the former case the bore was put down in the centre of the cretaceous basin, while in the latter it was near the edge and not far removed from the watershed. Mr. Jones, Conservator of Water to the South Australian Government, writes us that the flow from the first-named bore does not now exceed 400 gallons per diem. The bore is only 3 inches in diameter at bottom, and the flow of water has been impeded by obstructions in it. The cretaceous clays have been found to continue below the band in which the water was struck, and it is confidently anticipated that on going a little deeper a very large supply will be met with in a pebble deposit forming the floor of the formation. The diameter of the bore at Hergott Springs is 6 inches, and the flow of water 5,000 gallons per diem. The water is of good quality, fit for domestic use, and its temperature at the bottom of the bore is 82° Far. At Dunlop Station, 80 miles west of Bourke, wells have been sunk, the facts in regard to which are both interesting and important. In one a supply of fresh water was obtained at a depth of 488 feet, which rose to within 90 feet of the surface. Another well on the same station yielded an abundant supply from a depth of 573 feet, the water rising to within 15 feet of the surface. At a depth of 240 feet petrified wood, water-worn pebbles, dead fish, and marine shells were found. At 300 feet a tree 18 inches in diameter was found, and at a lower level of 143 feet a second tree was cut through. At 550 feet there were 5 feet of sandstone rock, and when the water was struck the auger dropped 2 inches into fine sand drift. The trees found resemble those growing on the surface, that at the higher level having its branches lying to the west. No particular significance, however, can be attached to this latter circumstance, even if it can be taken as an indication of the flow of the current at the particular time when it was deposited. It is clear that the lowest level at which water was struck in these wells was considerably below the level of the sea; and that the height to which the water rose in all or both of them was above the level of the Darling Gap at Wilcannia,—the elevations of Bourke and Wilcannia above sea-level having been ascertained by the railway surveys to be 346 feet and 260 feet respectively.

Employment of boring machinery.

It may be premature to accept these considerations as forming a conclusive argument against the theory of an underground river-flow to the ocean, but whatever inference may be drawn from the limited range of information at present available, the numerous facts adduced in evidence before us establish a strong presumption that there is a large quantity of water under the dry north-west country; and there is reason to hope that by the employment of boring machinery an abundant supply of good water can be made available for the use of stock.

Mud-springs.

Almost the only surface indication of the presence of water underground is to be found in the numerous mud-springs which occur to the north-west of the Darling, more particularly in the Paroo and Warrego districts, also in the southern part of Queensland. That remarkable spring at Gilgoin near Brewarrina is thought to be of this character. The proprietor of the station observing that his cattle became bogged in a slight depression, which is now the site of the spring, fenced it in and made excavations for a well. The bones of bullocks were dug out and at lower depths were found the fossil remains of kangaroos, and bones of what are supposed to have been the diprotodon and other extinct species of animals which, in bygone ages, resorted to this treacherous ground to quench their thirst. At a depth of 28 feet the water rose in sufficient quantity to drive the men out of the well, and the supply in the shaft has always been abundant. In the case of most excavations on the site of mud-springs the muddy overflow proves so unmanageable as to be a

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bar to sinking by pick and shovel. The temperature of the water in the mud-springs shows that it comes from a considerable depth, and the great thickness of the overlying clay-beds through which the water is forced upwards implies strong pressure from below. Professor Stephens is of opinion that these circumstances point with certainty to the eastern ranges as the source from which this water has its origin. Mr. H. Y. L. Brown, Government Geologist, thus describes the mud-springs in his report upon artesian water:—

> There is little doubt that the mud-springs are due to water at a pressure trying to come to the surface through a bed of clay which puddles it back, the result being that the water and clay mix and come to the surface in the form of mud. Where there is a strong body of water and a large amount of pressure, it clears a passage for itself and continues flowing without any admixture of mud, the passage through the clay gradually becoming lined with fragments of sandstones, &c., from below. All the mud-springs are in the same position geologically, the water coming from below the cretaceous clay marl and shale deposit which occupies so large a portion of the country. From a comparison of the different springs and wells, and an examination of the material raised therefrom, the conclusion is that there are three geological positions in which water is found in the area under notice.
>
> 1st. Near the surface in the sand, limestone, and clay deposits of the river flats, dry lakes, old watercourses, &c., of pleistocene age. In this case the water which falls on the sandhills and porous clay or silt flats, soaks into the ground until it meets an impervious bed of clay or other material, where it accumulates. Whether it is salt or fresh water depends upon the nature of the soil and rock in which it lies. As a rule the water found under these conditions contains a great quantity of salt.
>
> 2nd. Between the quartzite conglomerate beds and the cretaceous marl. Water falling on the quartzite conglomerite ranges, and being absorbed by them, would collect in the hollows of the cretaceous formation, and break out as springs at the lower levels of the former.
>
> 3rd. Beneath the cretaceous deposit and on the Devonian formation below. This is the main source of water supply indicated by the mud-springs and deep wells. The newer deposits on the flanks of the Devonian sandstones, grits, and conglomerates throughout the district receive a large quantity of the rain falling on them in the joints and cracks of the rocks, and in holes and cavities in the ground, by which means the strata become charged with water, which is conducted through the cretaceous strata, and is stored there until such time as the force of gravitation, pressure of superincumbent rocks or of gas, causes it to force its way to the surface.
>
> The cretaceous rocks being formed of horizontal beds of clay, marl, mudstone, shale, and limestone, and being overlaid by hard beds of conglomerate, are liable to settle down in places by the shifting of the strata through being softened with water, or removal of limestone by dissolution. Thus the water below and the pressure above acting together would cause the forcing up of the water through any available crack or borehole, and the forming of an artesian well. The cane-swamps, so-called, are depressions of this kind which seem to have been formed by a sinking of the ground. On many of them, where there are no native mud-springs, mounds may be seen which bear all the appearance of being the remains of extinct mud-springs. Pebbles and boulders of quartzite, sandstone, &c., are often found lying about on their surfaces, which may have been forced up at the same time in a similar manner to those seen at the present time at the active mud-springs.
>
> The existence of local subterranean channels containing flowing water at a moderate depth, particularly in limestone country, is very probable. In the case of the water found below the cretaceous formation, the evidence is in favour of its lying in the form of lakes in the porous strata, as it is found at different depths.

Cretaceous basin likely to afford artesian water.

There is a general concensus of opinion among geologists in this Colony whose views we have had an opportunity of learning, that the cretaceous basin will afford a supply of artesian water of good quality throughout its area; and the Government Geologist states the maximum depth at which borings may have to be made at 700 feet. Experiments made with the boring-rods are so far confirmatory of this view not only in New South Wales, but, as we have seen, in South Australia also. This expectation of obtaining artesian water from the cretaceous basin has been entertained for some time past by the Department of Water Conservation in South Australia, and has been supported by the fact that on the south and south-west flank of the formation a very remarkable and extensive series of mud springs exist with unlimited supplies of fairly good water, all of them however containing salts and lime in some degree. In the ranges 20 miles west of Lake Frome, there are numerous springs of fresh water, the temperature of the water in one of the springs being 130° Far. In the Siccus Valley, south of Lake Frome several artesian wells with good water have been obtained at a comparatively shallow depth.

Water in miocene formation.

The later marine formation which underlies the alluvial deposits south of the Darling at Menindie, and which extends under a large portion of the Murray, Murrumbidgee, and the Lachlan basins, occupying in this Colony an estimated area of

of 22,000 square miles, is also pointed to by the Government Geologist as containing abundance of fresh water at depths varying from 200 to 500 feet. As, however, the overlying fluviatile deposits of this region are generally porous, it is not to be anticipated that water from the miocene beds will rise to the surface.

Palæozoic strata.

The map which the Government Geologist has prepared, to show approximately the extent of the different water-bearing formations, allots an area of about 22,000 square miles—chiefly along the eastern slope of the Main Dividing Range, and including the Range itself—to the palæozoic rocks, in which the occurrence of a large supply of good water is exceptional; and an area of 118,000 square miles to the older alluvial deposits which form the surface of the vast plains of the Darling and the Lachlan, and which overlie the cretaceous, miocene, and palæozoic strata. In these salt water is of most frequent occurrence, but where continuous pumping is possible, thereby inducing a current, it is questionable, after experience both in this Colony and in Queensland, whether the supply would not be fresh.

Recent alluvial deposits.

Percolation.

Absorption.

Another important water-bearing formation is that of the recent alluvial deposits which occurs along the course of the main rivers and creeks, although rarely at the heads of watercourses. The water passes from the beds of many of the rivers by percolation and absorption. By the former is meant the flow among the particles which constitute the subsoil; and by the latter, the capability possessed by all earths and even rocks of taking up and holding a certain proportion of water in the same manner as a sponge. To a certain extent absorption and percolation stand to one another in the relation of cause and effect. Their action is curiously illustrated by the fact that the loss from streams flowing within embankments is less than the loss from similar streams flowing in cuttings, as was proved by Mr. Beresford, Executive Engineer in the Irrigation Department of India. With regard to the rate of percolation, Mr. B. Baker ascertained that the water from the Nile flows underground in a direction at right angles to the river at the rate of 1 mile per week. The amount of loss by percolation and absorption differs widely in different cases. The mean of two experiments made on the Macquarie between Dubbo and Warren by our Engineer, Mr. H. G. M'Kinney, showed that the loss in that river between those points from these causes is about $\frac{1}{2}$ inch in depth over the wetted surface in twenty-four hours.

Percolation from the Nile.

(5.) STORAGE OF WATER.

General remarks.

Having briefly reviewed some of the principal facts relating to the rainfall of the Colony, and the theory which has been formed to account for its rapid disappearance from the face of the country, it remains that we should consider what means can be adopted to utilize the rain-water to the fullest extent. It is almost superfluous to point to the fact that much of the rain which falls is almost tropical in its character, and the benefit derived from it is partial and temporary in comparison with the advantages which might be expected to follow had we the means of storing the floods of one season to supply the comparative drought of another. A fall of 1 inch in a day would be considered very heavy in Great Britain, where the rain is much lighter and more frequent; but here the Government Astronomer has preserved records of storms in which 10·610 inches of rain fell at Newcastle in two and a half hours, and at South Head, in which rain fell for upwards of twenty hours at the rate of 1 inch per hour. The amount of the rainfall is sometimes of less consequence than the period at which it comes; and a fall of 9 inches in the year over the north-western districts, divided into three falls of 3 inches each, occurring in spring, mid-summer, and autumn would, in its effect upon vegetation, be vastly more beneficial than a very much larger aggregate quantity dissipated in thin showers throughout the year, or falling at a time less favourable for the growth of herbage.

Necessity for systematic provision to avert loss to pastoral, agricultural,

Any attempt to accurately estimate the value of rainfall by a pecuniary standard must of course be illusory, although doubtless there are many who will agree with the Government Astronomer in thinking that there is good reason for the assertion that, "an inch of rain over the whole Colony at the right time is worth a million

million of money," is not an exaggeration of the pecuniary loss which might be averted by a timely rainfall, to say nothing of the unutterable anguish of many thousands of animals, which in a period of drought perish by slow degrees from hunger and thirst. Although fully aware that the loss which results to the Colony from droughts cannot be stated with arithmetical accuracy—in the case of the husbandman it is sometimes the complete frustration of his year's toil, and in that of the pastoralist the annihilation of a large part of his capital—still an attempt (even though the data should be held in some respects to be erroneous) to form a definite idea of the measure of loss from droughts is not without value. If we put the low price of 6s. 8d. per head as the value of a sheep, including wool and carcass, we see reason to suppose that the loss of the Colony from the droughts of 1881, 1882, and 1883, in sheep alone, amounted to upwards of £2,000,000 per annum. The data from which this deduction is drawn will be found in the following figures, which have been compiled by the Chief Inspector of Stock from his Official Reports:— and mining interests, and to promote health.

Number of sheep on 1st January, 1881, as per report	35,300,000
Natural increase, say 12 %	4,236,000
Total at 31st December, 1881	39,536,000
Number of sheep on 1st January, 1882, as per report	36,500,000
Loss to 1881	3,036,000
Number of sheep at 31st December, 1881	39,536,000
Natural increase, say 12 %	4,744,320
Total at 31st December, 1882	44,280,320
Number of sheep on 1st January, 1883, as per report	36,100,000
Loss to 1882	8,180,320
Number of sheep at 31st December, 1882	44,280,320
Natural increase, say 12 %	5,313,638
Total at 31st December, 1883	49,593,958
Number of sheep on 1st January, 1884, as per report	37,900,000
Loss to 1883	11,693,958
Number of sheep at 31st December, 1883	49,593,958
Natural increase, say 12 %	5,951,274
Total at 31st December, 1884	55,545,232
Number of sheep on 1st January, 1885, as per report	31,600,000
Total loss in these 4 years	23,945,232

23,945,232 sheep @ 6s. 8d. per head = £7,981,744 loss.

This calculation assumes that the Colony is capable of depasturing 55,000,000 of sheep if efforts were made to conserve and utilize the rainfall; and we cannot suppose that this will be regarded as a too flattering estimate of our grazing resources. Each drought which afflicts the Colony may be said to be more injurious in its consequences than any of its predecessors, for the reason that there are more stock in the country to suffer. One witness states that fully one-half of the horned cattle in the Gwydir district must have died during the last four years, and a great many sheep; but that a system of water conservation would reduce the deaths to a small percentage annually (Q. 3972). Another thinks that in the late droughts the deaths of animals have been as 3 and 4 to 1 in comparison with the mortality in previous droughts (Q. 4840). Taking a radius of 100 miles from Walgett, it is given in evidence that during the last five years, taking all the runs in the district into consideration, we have lost about 60 per cent. (Q. 4971 and 5141.) Loss of stock through droughts.

The pastoral and agricultural interests being, in their present stage of development, wholly at the mercy of the vicissitudes of the weather, suffer more directly and severely than any other interests of the Colony from the sharp alternations of General losses through droughts.

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wet and extremely dry years; but inasmuch as each interest in the Colony is interwoven with every other, it is not too much to affirm that every class of the community participates in the privation and suffering which are born of adverse seasons, quite as much as in the comfort and wealth which result from bountiful harvests and the increase of flocks and herds. It would be easy to multiply instances of the loss which has overtaken mining industry, and the time when work upon the tin-mines of the northern districts, the gold-fields of Temora, the copper-mines of Cobar, and the argentiferous lodes of Silverton, had almost to be abandoned for the want of water, not simply for industrial purposes, but even for human consumption, must be still fresh in the recollection of most colonists. The greater prevalence of typhoid throughout the country during the late dry years seems to imply that the health and comfort of large numbers of the community, more particularly of those resident in the outlying districts, must have been very seriously injured by the scarcity of water—scarcity in many cases for even domestic use. The industries of the country, which are more immediately dependent on the soil, have about reached their maximum development under present conditions; and it will probably be admitted that if scope is to be given for the prosperous settlement of a larger rural population than that which now exists—if the stock-carrying capabilities of the country are to be increased—if agricultural activity is to be extended and made permanent—if the railways, which Government has constructed at a cost of many millions to the State, are to be made remunerative, and to accomplish the important ends for which they have been established—it will be necessary to make the largest and most systematic provision for the conservation of water, as the one element needed to give vitality to all the other possibilities of production.

Reservoirs at head waters.

The possibility of forming storage reservoirs at the head waters of the tributaries of the principal rivers is a question which appears to have hitherto received little or no attention, but, from the partial examination of the country by the Commission, they entertain no doubt that an instrumental survey of the different river basins will demonstrate that there are numerous sites for conserving reservoirs of very large capacity, and that by this means the easement of floods would be to some extent accomplished, and the streams of the rivers themselves controlled. As an instance of the construction of reservoirs at the heads of rivers, we may cite the dam at Campbelltown, Tasmania, which holds back 6,048 million gallons, and was constructed at a cost of £7,600.

Weirs upon effluent creeks.

Of the various methods of conserving the rainfall, that which commends itself to our judgment as producing the largest results for the smallest outlay of capital is one which Nature itself has strongly impressed upon much of the flat, dry country of the western and south-western plains. A prominent characteristic of streams subject to flood flowing through long reaches of flat country is to choke up their channels and to deposit banks of alluvium upon their edges, so that, paradoxical as it may appear, their banks are often higher than the general level of the delta through which they run. The ordinary channel not being sufficient to carry off the floods discharged upon it in times of heavy rain, the water has in many districts cut subsidiary drains through the soft soil; and the result is that there have been formed many hundreds of miles (we believe we should be within the bounds of accuracy were we to say many thousands of miles) of canals into which the waters are backed up, until such time as, upon the subsidence of the inundation, they recede into the river at the point of outflow or run into it again at some lower part of its course. These effluent creeks, cowals, warrambools, tallywalkas, billabongs, or anabranches, as they are variously called in different districts of the Colony, often communicate with large natural depressions capable of being formed into permanent lakes. The works required to retain the flood-waters in these creeks and lakes would in most cases be few, simple, and inexpensive, so far as impounding the higher flood-waters are concerned; and all that would be necessary, besides improving and defining the channel, to keep them permanently supplied, would be to place movable weirs across the rivers at the points of off-take, and sluice-gates in the creeks to prevent the return of the water to the main stream.

Natural depressions to be used as lakes.

Weirs across rivers.

A glance at the map of that portion of the Colony lying between the Murray and the Murrumbidgee, both of which are to some extent fed by snow-waters after the rains have ceased, will show from one to two thousand miles of natural channels such as those to which we refer, which it is quite within the resources of those rich districts to make available. Judging merely from the map, this part of the Colony is extremely well watered; but, for the want of systematic effort on the part of the inhabitants and of proper legal provision on the part of the State, the numerous creeks and rivers which intersect that area are nearly always dry, and the productive powers of the soil often paralyzed, while almost every year water sufficient to supply every demand for human and stock consumption and all other industrial purposes, including to a limited extent that of irrigation, is allowed to drain off to the ocean unused. Effluent creeks: Murray and Murrumbidgee.

The Government of Victoria and the residents of the Swan Hill Shire in that Colony have recognized what may be done in this direction, by the enlargement of the outflow of the Murray into Gunbower Creek (a work to which this Commission has taken exception); and making provision for draining off water at the higher flood-levels into the bed of the Loddon, and thence into a numerous chain of swamps and lakes to the north-west. (Vide Appendix, Secretary's Report.) It is satisfactory to observe that the fall of the country on the New South Wales side of the Murray is specially favourable for the distribution of its water in the district between that river and the Billabong, as is exhibited by the numerous effluent creeks which carry the Murray flood-waters, beginning at a point near Tocumwall, and flowing north-west in the direction of Deniliquin, Baratta, on to near the junction of the Murrumbidgee. Water conservation in Victoria.

The works which Mr. Tyson has carried out near Oxley on the Lachlan River may be cited as a good illustration of the manner in which favourable conditions of surface level can be turned to practical account by even individual effort. Mr. Tyson says (Q. 2834):—"I have made several cuttings from the back waters which have filled up a number of lakes, in some of which I have a supply of water for years to come. In one of these lakes the water is 50 feet deep. This cutting is from 1 to 6 miles long. I am making another cutting from Waljeers which will be about 20 miles in length. I make use of the natural depressions so far as they follow the course which the cutting is to take, and I excavate a canal in the ground between the depressions. Where I am making the cutting it is 30 feet wide, and from 4 to 7 feet in depth. I made another cutting between Lake Bonarey and the Merowie Creek. The lake was filled and the water lasted for seven years, but during the last three years there has been no water in it. I only wish to intercept the flood-water." As a consequence of these improvements, from 40,000 to 50,000 sheep are depastured where not more than 20,000 could have been fed before. Conservation of flood-water by private enterprise.

We are not disposed to ignore or make light of the constructive difficulties which would have to be overcome in any scheme which involved the placing of weirs across such rivers as the Darling, the Lachlan, the Murray, and the Murrumbidgee; but much of the conservation to which we have called attention could in periods of high floods be accomplished without making weirs, movable or otherwise, in the main streams below the points of off-take. In the absence of details such as can only be obtained after the preparation of plans and specifications, it would be unwise to say that the Colony is not populous enough or rich enough to place weirs across the Darling or the Murrumbidgee. That such works, placed in properly selected positions, and carried out under proper professional supervision, could be constructed there is no reason to doubt. In the absence of any special examination and study of the question by the engineers in the service of the Government, it may not be out of place to refer to the opinions of non-professional witnesses, of whom Mr. R. C. Webb may be taken as an example. He says that if a weir were well constructed on the Darling there would be nothing to prevent its standing, as there is no heavy rush of water in the river; and that even such rough and cheaply constructed dams as have been placed by private individuals across the Lachlan stand well enough until they are cut away when water is wanted (Q. 2696). The dams which have been made by private individuals Weirs on rivers. Constructive difficulties.

in different parts of the Colony, particularly the overshot dams in the Culgoa and Birie, and weirs such as those which have been successfully constructed by the Victorian Water Trusts over the Loddon and other rivers, may be taken as a clear indication of what may be safely attempted on a somewhat larger scale, with special caution as to the accumulation of silt. This, however, is a class of work in regard to which we should proceed tentatively and with great caution; and, above all, it is of the utmost importance that no weir should be constructed in any river until after such surveys have been made and levels taken as will fully determine the effect which such weir would have on the river and on the adjacent country. The sites for weirs will require to be selected with great care. The rocky bars which are frequently found in the western rivers, and particularly in the Darling, will probably afford the best sites for weirs in those rivers. Hence, before removing or interfering with any bar, the possibility of its being required for a weir site should be well considered.

Rocky bars in rivers.

Some of the peculiar circumstances with which we have to deal are extremely favourable. Thus, for an example, in many districts the fall in the creeks is so small that for every foot in vertical height the water would be held back nearly a mile. The subsoil of the country throughout nearly the whole of the Darling basin consists of impermeable clay, and no better holding-ground for water could be desired. A similar remark applies to a great portion of the country between the Murray and the Murrumbidgee. In the case of newly excavated dams, from which the water is found to soak away rapidly, pastoralists find that they can be easily puddled by the trampling of sheep, and in the second year form perfectly good holding-ground. Once the creeks of the district were thoroughly well saturated the loss of water by percolation would not be excessive. It is in cases where their beds become dry and cracked by long exposure to the sun that the loss of water is so great; and it is one of the heavy drawbacks which accompany the present intermittent system of flooding that the enormous amount of absorption from the bed of the channels until saturation point is reached prevents the waters from the rivers when in moderate flood from flowing more than half the distance which they would otherwise run; and hence it happens that the settlers who live at distances of from 50 to 100 miles from the point of off-take receive no benefit from moderate floods in such rivers as the Murrumbidgee, more particularly when the flood is of short duration. Irrespective of the great body of experience which has been obtained on this point, the opinion of the Government Geologist is assuring. He states (Q. 1027) that if canals were made on the lower part of the Darling, the soil is sufficiently impermeable to allow of the carrying of water through the country by means of canals. "For a year or so perhaps the water might percolate through, but after that the sides of the canal would become puddled; then the water would not soak away." And again (Q. 1029), "I have known races to be cut through sandy soil, and after the water has been flowing through it for a year they have become practically impermeable. In the Riverina country the water soaks away from some of the banks and dams during the first season. I think that a scheme of canalization is perfectly practicable."

Levels suitable. Soil impervious.

Not only is the soil from its nature well adapted for the storage of water in the beds of creeks and other natural depressions, but it is extremely favourable, also, as to general surface level, for the formation of canals and subsidiary channels for the distribution of water over the plains. Throughout hundreds of miles of country the occurrence of rock or stones is phenomenal, so that the excavation necessary for this purpose can be done at a cheap rate. Excavations made by Mr. James Tyson, junr., on his stations in the Lachlan District, by means of bullocks and scoops, have been done at a cost on an average of about one shilling per yard.

Distributing channels.

(6.) TANKS AND DAMS.

During the last fifteen years great waterless districts to the west and north of the Darling have been reclaimed from their normal condition, in which neither man nor beast could live, except immediately after rain, and have been made

Important results from tanks and dams.

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to contribute to the pastoral production of the Colony. The principal means by which this important extension of the habitable boundaries of New South Wales has been accomplished has been by the excavation of tanks and the construction of dams, wherever the configuration of the Colony admitted of the latter means of storage, as on the Culgoa, Warrego, and Paroo.

Dams. The construction of dams in the older settled and more thickly peopled districts to the south-west has, owing to the want of proper legislation, been to a large extent prevented by the risk of having them destroyed. One case may serve as an illustration of many. We quote from a communication made to us by the Hon. W. A. Brodribb (*Evidence*, p. 84.)

> About the early part of 1858 a party of men went up the creek in the middle of the night and destroyed the Corec Dam, the property of Messrs. F. and G. Desailly, who repaired it, and for weeks kept armed men to prevent it being destroyed again. However, a party of twelve men went up the creek and destroyed about twenty-three dams, under the impression that their runs would be supplied with water. This destruction of property was perpetrated by men who had neglected to secure water by construction of dams when the creek flowed through to the Edward River for weeks, but they were doomed to disappointment, for, having cut the dams, they found the water did not run more than two or three miles below each dam. They came to my house on the 17th November, 1858, and told me they had burnt my upper dam by fire, there being no water in the dam at the time. They went to my house dam and cut away two panels, but there was very little water in the dam at the time. I prosecuted them before the Deniliquin Court of Petty Sessions, and three of them were committed to take their trial at the Goulburn Quarter Sessions to be holden on the 10th January, 1859. I had to go by Melbourne, thence by water to Sydney, and on by mail-coach to Goulburn, and, after all, the men were acquitted, and afterwards brought an action for damages against the Magistrates for committing them, and I had to attend at the Supreme Court in Sydney at a great deal of inconvenience. The case went on for sixteen days, when the men withdrew it, and they had to pay all costs. I repaired the dam after it was cut. This dam had been constructed twenty-eight years back, and has never been empty since, and has supplied the Wanganella township with water, besides having supplied the stations on each side with water.

Tanks. The excavation of tanks has been a work of enormous difficulty and cost, owing to the necessity of having to cart water, as well as other supplies, from the last frontier line of settlement at which the rain had been conserved. In selecting sites for tanks care has had to be taken to fix upon localities having a catchment area sufficient to supply the number of sheep to be watered at them, and where, from the slope of the surface, by means of shallow drains extending for long distances, even the smallest amount of running water might be conducted into the tank. None but those having at command a considerable capital could undertake works of the magnitude required to store water sufficient to supply the requirements of their stock for a period of from one to two years.

Capacity. It is probable that there is no part of the Colony which is absolutely without rain for so long a time as two years, but the contingency which has to be provided against in some localities of the interior is practically of that nature, as the rains which fall are generally so small in quantity as to be at once absorbed by the arid surface. In 1876 it was stated, on what the Government Astronomer considered to be good authority, that on one station on the Bogan no rain had fallen for thirty months; and Mr. Licensed Surveyor Donaldson, writing from 80 miles above Gongolgan, said that "in the five years, 1864 to 1868, thirty-seven months have been absolutely without rain, unless for five or ten minutes; eleven months have been distinguished by only one or two good showers, or perhaps a day or two of light rain, leaving only twelve months in which there was good rain. The Bogan has only run through to the Darling five times in five years; and two very slight freshes have only gone part of the way down." Under such untoward conditions, tanks of small holding capacity would altogether fail; and it may be that one of the causes why so many selectors have been starved off their holdings is their inability to provide themselves with large and deep storage for water. In droughts such as those immediately referred to tanks would require to have a capacity of from 15,000 to 20,000 cubic yards, and a depth of about 20 feet.

Construction. In the most approved form of construction the water flows through a small silt-pit previous to entering the tank. The material excavated from the tank is deposited all round the edges, where it quickly consolidates and greatly enlarges the capacity of the tank, while at the same time the banks serve to shelter the water

water from the play of dry winds which sweep away the moisture as quickly a it is evaporated over the water surface, and which, in tanks not so sheltered, cause sufficient movement upon the water surface as to sensibly affect the amount of soakage from splashing against the banks. In tanks of this description, where the slope of the surface does not permit their being filled by flumes, horse-pumps, stationary engines, and windmills have been found very useful for the purpose of pumping water over the embankment, and so filling the higher levels. Where tanks are constructed in this way the quantity of silt brought into them is reduced to a minimum, and provision is made by pumping appliances for watering at troughs, thereby preventing silting and damage to the banks, and the pollution and waste of water in fleeces of sheep where the animals are allowed to drink direct from the tanks. Mr. Doyle, Stock Inspector, is of opinion that a tank having a capacity of 10,000 yards will give a supply for a longer time with pumping than one of 20,000 to which the sheep are allowed to go direct, as they carry in silt and carry out water in their fleeces. In some cases tanks 18 feet deep to which sheep have had direct access have been silted up in five years, hence the necessity of the newer mode of construction.

Number of tanks.

The conservation of water in tanks in this Colony has been more extensively carried on than that by any other means. It is applicable to a much larger area of country than that upon which dams can be made, and experience seems to have convinced pastoralists that it is far more certain and economical than the sinking of wells. If, however, the search which has been made for underground water had been made in the light of the information supplied by the Government Geologist as to the strata in which water might be expected in different parts of the Colony, it is probable that much of the enormous loss of capital which has taken place in well-sinking would have been avoided. We observe that, in the report of the Chief Inspector of Stock for 1884, that officer, from the information supplied to him, estimates that the total number of tanks excavated in the Colony was 17,071, and that the expenditure upon them has been £3,960,472, or an average cost for each of £232. He puts down the number of dams at 8,579, and their total cost at £835,838.

Stock routes.

Of late years Parliament has made annual appropriations for providing water on the stock routes in the remote dry districts of the Colony, and upwards of £200,000 has been expended upon that object. At the beginning of this year there had been handed by the Roads Department (which constructs works for water supply to stock in localities indicated upon the recommendation of the Inspector of Public Tanks and Wells) to the Department of Mines seven wells, four dams, ten springs, and thirty-five tanks, the aggregate of the tanks being 73,500,000 gallons, or an average of 2,450,000 each. There were twenty-one others almost ready to transfer, having a capacity of 69,000,000 gallons, or an average of 3,250,000 gallons per tank. It is expected that at the end of 1885 there will be a total of 134 watering-places in charge of the Inspector of Tanks and Wells, and taking the average standard distance apart as 15 miles, this represents provision for something like 2,000 miles of road (Q. 3427). When the tanks are not leased they are placed in charge of caretakers, who report, through the Stock Inspector of the district, weekly, to the head of the department in Sydney. Charges are made for supplying water to stock, but the revenue derived (about £400 per annum) is less than one-tenth of the cost of supervision, so that construction and maintenance are wholly defrayed from the public revenue. The extremely dry weather during the last year or two has made it exceedingly difficult to obtain contractors for works of this description in the remote districts, and hence it is that larger provision has not been possible. In the event of a system of local Trusts for purposes of water supply being called into existence, it may be expected that the Government will be in a position to hand over the tanks already made to the care of the local bodies, and so save a large proportion of the outlay for supervision and maintenance which has now to be incurred; and that the annual appropriations made for watering stock routes will be available as subsidy to induce local bodies to make provision for supplying water to travelling stock where necessary as part of the general scheme to meet the requirements of their districts.

In

In Queensland the railway embankments have been used as a subsidiary means of storing water, more particularly at Rocky Creek, Tolmies Range, Wallaroo, and the 191st mile on the Central Railway, with the most satisfactory results, and the Engineer for Central Queensland, Mr. R. Ballard, states that he considers that, since the Queensland railways generally run east and west, and the flow of the water is generally north and south, the system is one which should be largely adopted. There may be circumstances in which embankments may be made to serve the double purpose of railway traffic and water storage, but they are probably exceptional, and engineers generally incline to the opinion that the danger to the stability of the road would outweigh any advantage likely to be gained by such shallow storage as would be practicable. Railway embankments.

(7.) WELLS.

The pioneers of settlement have not been slow to recognize the great value of a permanent supply of water from wells, where it is stored under conditions of temperature and shelter which protect it from waste by evaporation. It is quite within the range of probability that tanks may silt up, or in the course of a long drought may have their contents exhausted by evaporation; but the supply from a good well is practically independent of the vicissitudes of the seasons. Of the total number of wells which have been sunk, a large proportion have yielded water so salt as to be unfit for use, or no water at all. Mr. James Tyson states that he has sunk a great many wells on the Lachlan to a depth of 80 feet, and that the water in all of them was perfectly salt. Out of from 150 to 200 wells sunk by Mr. R. C. Webb, of Kilfera, only two contained water which stock would drink, but not sufficiently good for human consumption. If feed be abundant, sheep will drink water which contains as much as 800 grains of salt per gallon; but in many cases the water struck contained as much as 1,200 grains per gallon. Of forty wells sunk by Mr. Fartiere, on Marfield, the water of only two could be used. Mr. F. Y. Wolseley put down thirteen bores, and the analysis proved that the water obtained contained more salt than that in the sea. Instances in which the search for pure well-water have been similarly disappointing could be multiplied almost indefinitely. There are localities in which the existence of underground water has been discovered and turned to account by means of wells; but it has happened in many cases that, of two wells sunk within a few yards of each other, one, and the deeper of the two, has been perfectly dry, while the other has passed into a water-bearing drift. Similarly, the water from one well has been found to be as salt as the sea, while that in a well a quarter of a mile distant from it has been perfectly fresh. If all the experience which has been gained by well-sinkers throughout the Colony could be plotted upon a map, deductions could be drawn which would be of great assistance to those who may hereafter sink wells; but in the absence of that information, and of anything like determinate surface indications, the sinking of wells has been found in most cases to be a very costly, and in many an almost ruinous undertaking. There are no doubt portions of the country which form an exception to the general experience; but even there it should be recollected that, in addition to the serviceable wells, there have been a large number of failures whose history and existence quickly pass into oblivion. Over a considerable area of country along the Murrumbidgee an abundant supply of fresh water may be obtained at a depth of from 120 to 200 feet. A supply in less quantity, and generally somewhat brackish, is often obtainable at a depth of from 70 to 80 feet. The water which is found at the lower depth is always found in the same description of drift; and, although when struck it rushes into the well in such volume as to compel the workmen to retreat with the utmost speed—in one case rising 110 feet in three minutes—it never rises to a higher level than the first water-bearing strata, not even where tubing is used. In one well about 40 feet from the river-bank the water rose to within 80 feet of the surface, and although the flat was covered with flood-water the height of the water in the well was not increased; neither does the height of the water vary appreciably winter or summer. A witness, examined at Jerilderie (Mr. J. D. Rankin), also stated that it was very rare indeed to hear of a well being sunk on the

Value of wells.

Risk of obtaining salt water.

Murrumbidgee.

the plains near that place without water being obtained. In the Macquarie, near Dubbo, and the Castlereagh, the water from the river premeates underlying strata for a considerable area; and an abundance of good water is to be obtained in wells of moderate depth. Mr. T. K. Abbott, S.M., has contributed valuable information respecting wells in the Liverpool Plains district, extending over an area of about 100 square miles. It seems probable that a large number of the wells, of the position, depth, strata, and water of which he has obtained particulars, situate in the basins of the Cox and the Mooki, derive their supply from the soakage out of those streams, but there are several which appear to be fed by an underground flow from the spurs of the Main Dividing Range. Of eighty-nine wells in the basin of Cox's Creek and the Mooki, seventy-three bottomed in sand or gravel with an abundance of fresh water, six in clay with brackish or salt water, eight in rock with water hard to brackish, one in sand with water bitter, and one in rock with water good. The depths and situation of the wells justify the inference that water may be obtained at a moderate depth in sand or gravel almost anywhere in the county of Pottinger. Among the more remarkable wells described by Mr. Abbott is that at Bando, situate in basaltic country, near the foot of a range having an elevation of 1,600 feet higher than the well itself, which is on a slope about 150 feet above the plain. The well is 90 feet deep, and the supply, which is artesian, is at the rate of 20 gallons a minute, although, prior to the timber being sapped in the locality, it was with difficulty that a team of bullocks could be watered there. With respect to two other wells, Mr. Abbott wrote:—

Liverpool Plains.

> To the north-west of Bando there is a most remarkable spring at Garrawilla head station, and upon a recent visit I availed myself of the opportunity to measure the outflow. I found that this spring yielded the enormous quantity of 9,600 gallons per hour. I rode over the spring where it makes its first appearance, and was surprised to find the ground quite hollow for a space of upwards of 100 acres, and upon listening attentively one could hear the sound of rushing water under foot. In many places there happened to be large fissures or holes in the ground, and the water could be seen rushing along on its subterranean course at a depth of about 3 or 4 feet from the surface. A large dam has been erected below this spring, and one of the most extensive sheep-washing establishments of the Colony is supplied with water by powerful engines from this dam. The whole area of the valley in which the spring arises does not exceed 2,000 acres, and the yield per annum at the rate quoted amounts to nearly eighty-five millions of gallons of water. There can be no doubt whatever that the source of this spring is far removed from the drainage area of the valley in which it occurs.
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> On Moredevil Station, near the source of Cox's Creek, many years ago, a well was sunk to a considerable depth. The exact depth I have been unable to ascertain, but believe it was about 80 feet. No sign of water was obtained before this level was reached, when, as the workmen broke through some hard rock, the water rushed in so rapidly that they were compelled to abandon their tools and make good their escape by means of a rope and windlass. In a few hours the well was filled to within 10 feet of the surface. Some years ago, as the well just described exhibited symptoms of caving in, another well was sunk about 80 yards easterly from the first. This well is 100 feet deep, and is situated higher on the slope by 4 or 5 feet than the first well. When the bottom was reached the water came as rapidly as on the first, and rose to within 4 feet of the surface, and on the following morning the first well had overflown, and a strong stream amounting to upwards of 300 gallons per hour was flowing from it. This has continued ever since, through all varieties of seasons, without cessation.

Underground supplies of water in old drifts.

The Government Geologist, in his evidence, refers to the large supplies of water underground with which the tin-miners of Emmaville and Cope's Creek have had to contend, and the copious flow of water which the gold-miners have had to encounter in the deep leads of Gulgong, chiefly in old river drifts underlying basaltic rock; while Mr. Henderson, the Superintendent of Drills, describes similar experience, and tells us that, in a comparatively small area at Ballarat, from seven mines there is pumped twenty million gallons of water per diem, and that one of them has been pumped for upwards of two years and a half with little or no signs of decrease.

Upper Darling basin.

The Government Geologist regards the cretaceous formation of the Upper Darling basin as one of great importance, and he anticipates that if bores be put down to a sufficient depth, it will be found to contain water enough to supply the whole of that part of the country (Q. 1001.) It is his opinion that this supply is not derived from the local rainfall, which is evaporated from the surface or finds its way into saucer-like depressions. It is from these stagnant underground reservoirs nearest to the surface that the salt water found in such a vast number of instances throughout the alluvial plains of the interior is drawn. The abundant supply expected from the cretaceous formation is artesian. We may mention some of the facts which exemplify this

this theory. On the Killara Station west of the Darling, two bores have yielded an artesian supply. One known as Weewatta, discharging from a pipe 144 feet deep, delivers from 7,000 to 8,000 gallons per diem 3 feet above the surface; the other (Mullyco, 15 miles to the north-west), 44 feet deep, supplying from 12,000 to 13,000 gallons per diem 4 feet above the surface. At Dunlop Station, supplies of fresh water have been obtained from wells from 500 to 600 feet deep. At the Government bore at Goonery, 54 miles west of Bourke, water flowing at the rate of from 600 to 270 gallons, at a height of 20 feet above the surface, has been found; and at another Government bore, 7 miles further west, a supply of 106 gallons an hour, rising more than 6 feet above the surface, was obtained from a depth of 464 feet. Comparing the depth of the two bores, the Superintendent comes to the conclusion that there is a dip in the cretaceous basin in this locality at the rate of 60 feet per mile.

Presence of salt water near surface not a discouragement.

In almost every case in which fresh water has been discovered, salt water has been struck at higher levels, and often near the surface; and therefore the prevalence of salt water near the surface should not act as a discouragement to deeper exploration. The Government Geologist, however, says that the clay-beds in which water is confined, but through which it does not circulate, do not usually extend far in any direction. Where the well is tubed, it is an easy matter to shut out the salt water; but as the great majority of wells are sunk by pick and shovel, if the in-flow of salt water is very strong, there is the utmost difficulty in puddling it back, more particularly when clay suitable for the purpose has had to be carted 30 and in some cases 60 miles.

Presence of salt water explained.

The prevalence of salt water in all the alluvial formations is explained by the Government Geologist as being caused by their fresh-water origin. The débris washed from the ranges has been deposited quickly, and the decomposition of mineral constituents arising from the moisture has converted the fresh water into salt. Sulphate of alumina, lime, and magnesia have been formed, and salts have been chemically produced. In the marine formations the soluble parts of the minerals have been washed out by the long-continued action of the sea-water. Wherever the water flows underground it is fresh, and wherever it is stationary, as it may be in clay-beds a few yards away from the current, it will be salt. The saline nature of the soil has given rise to well-marked peculiarities in the herbage, such as in the salt-bush.

Diminution of saltness of water.

It has been found that after wells have been freely worked for some time the water in them becomes much less salt by reason of the exhaustion of the mineral salt contained in the soil through which the water drains into the wells (Q. 2,870). Mr. H. A. Gilliat, the Inspector of Tanks and Wells, speaking of the brackish wells between the Lachlan and the Darling, says:

> There is an ample under-ground supply, and my belief is that the water gets its saline properties form the strata in which the wells are sunk. The strata are heavily charged with salts. In 1879 I tasted water from the Holybox well; up to that time it was so salt that no animal would drink it. I collected from 20 to 30 lb. of clean crystals of salt which had formed around the service tank and troughing. I recommended that the well be condemned, and forwarded the statements of people who had resided in the locality from the time the well was sunk; they all agreed that from the very first the water had been undrinkable. At the end of 1883 a tank was being constructed in the locality, and the contractor not having any supply of water for his horses tried that in the well, and found that the animals would drink it; on making further inquiries, I found that there was much more water in the well than there was in 1879; this I attributed to surface drainage. The water was baled out of the well, and that which came in afterwards found to be good enough for stock. There are several other wells in which the quality of the water has improved in the same way.

Bore at Goonery Springs.

Considering that there has been an enormous fruitless expenditure upon wells, it cannot be expected that pastoralists will continue to invest their capital in well-sinking—however much a good well is to be preferred to tanks—until the boring rods shall have given better assurance than any which now exists (except in certain localities on Liverpool Plains, the Murrumbidgee, the Lower Lachlan, and the Macquarie) of the probability of striking the underground channels through which the fresh water circulates. The value of the bores west of Bourke is very much lessened from the fact that there was already an abundant supply of water from the Goonery Springs before the bore was put down; and the great cost of the boring operations conducted.

conducted by the Government is not calculated to lead pastoralists to view the enterprise with much favour.

Drilling plant.

Should Mr. Wilkinson's anticipation that fresh water, in abundant quantity, is to be found all over the cretaceous basin, within a maximum depth of 700 feet, be realized, we may hope that engineers, having their own boring plant, and trained men to work it, will find a large field for employment in the north-western districts. With the certainty of finding water there can be little doubt that boring appliances, adapted to the special work required of them, would be forthcoming, and that tube wells would be sunk with an amount of economy and despatch which has not hitherto been attained. Reference to the evidence of Mr. Darley (Q. 1674 and sequel) shows that, in California, where wages are as high as in New South Wales, and the strata similar, the owners of drilling plants eagerly compete with each other in the business of well-sinking; they accept all risks arising from breakages to plant and if they do not find water it is a condition of the contract that they are not paid.

Use of metal tubing.

The secret of getting the water to rise to the surface lies in the use of metal tubes, for, no matter what the pressure might be from below, it is hardly likely that water would rise higher in the well than to the permeable strata. Without the casing the water when it rose to a certain height would disperse with the upper drainage. The same conditions no doubt exist in many of the wells of this colony in which the height of the water cannot be increased by any inflow from the surface, nor its depth reduced more than temporarily by any amount of pumping it has been possible to apply to them.

Influence of atmosphere on flow of springs.

It has been observed that the flow of water from some springs in different localities is very sensitive to the pressure of the atmosphere; and the Government Astronomer offers the following explanation of these interesting phenomena:—

> In several places, notably on the Kallara Run, there are wells where the supply of water varies with the state of the atmosphere. That has been noticed in a number of places in the Colony; that is to say, the differing states of the atmosphere affected the quantity of water discharged. There has been a marked instance of this effect on a station to the south of Cooma—Babandarra Run. The water there in a certain creek stops running, and when it commences to run again the circumstance is regarded as a sign of rain. The explanation of this is to be found in the variation of the barometer; when the barometer falls the pressure is removed, the air inside expands and forces the water out. When a barometric depression has passed over the country water has been known to commence running in many places. There are wells in the Murrumbidgee in which the quantity of water varies with the state of the atmosphere. There is another instance on the Gundare Run, close to Coolah.

(8.) IRRIGATION.

Erroneous views on irrigation.

The first use to which water saved in the country districts will be put will be for domestic and stock purposes; and after these demands have been satisfied there is no better service on which water can be employed than that of irrigation. An erroneous impression which we have found to prevail among some witnesses is that the advocates of irrigation think it practicable to irrigate the whole of the western plains. It is not a matter for surprise, therefore, that the notion of irrigation should be scouted by those who are painfully familiar with the sparse and irregular character of the rainfall in that part of the Colony. In no part of the world, not excepting countries the most favourably situated for the purpose, can any large proportion of the soil be brought under wet cultivation.

Spain.

It should be borne in mind that as a general rule the countries in which the land most requires artificial watering are those in which the rainfall is most limited. For instance, Spain, which is a dry country with an uncertain rainfall, is in a great measure dependent on irrigation for agricultural produce of all kinds; and although irrigation has been practised there for many hundreds of years, it is estimated that the land so treated constitutes only 5 per cent. of the total area of the country. This small proportion includes irrigation of every kind, and is the amount estimated in the Spanish Government returns; but Moncrieff, after inspection of the agriculture in all the provinces, concluded that this estimate is greatly in excess of the actual area. In

Lombardy

Lombardy circumstances favour irrigation to a degree scarcely approached elsewhere. Remarkable fertility of the soil, a supply of water far in excess of the requirements of the entire country, regularity in the slope of the land, beneficial legislation, and an industrious peasantry, combine to make Lombardy, as it is, the best irrigated country in the world. Yet even here the irrigated land is only one-sixth of the whole area, or one-fifth of the productive area. Lombardy.

In the preparation of estimates for canals in India it is generally assumed that of the land actually irrigable from a canal not more than one-third will ever be under irrigation at the same time. The most highly irrigated of the large territorial divisions of that country is the one included under the name of "the North-west Provinces and Oudh." The Upper and Lower Ganges canal system far exceeds in magnitude and importance any other irrigation work in the world, and, in addition to these, there are in that part of India similar works of the first rank. Yet here the total irrigation from canals is scarcely 5,000,000 acres, out of a total area of nearly 68,000,000 acres. It must, however, be added that in these provinces wells for irrigation are reckoned by the thousand, though no records of the areas so cultivated are available. Still it is improbable that the total irrigated area exceeds one-tenth of the area of this province. The total area included within the territory now known as the Punjab is about the same as that of the North-west Provinces and Oudh, being slightly over 68,000,000 acres. The area irrigated in 1877–78 was 1,320,000 acres; but as the Great Sirhind Canal, designed to irrigate three-quarters of a million acres, has been in operation for the past three years, the area now irrigated from canals is probably not less than two million acres annually. In this province also well irrigation is carried on very extensively; but on a much smaller scale than in the North-west Provinces and Oudh. Still it is improbable that the irrigated area amounts to more than 5 per cent. of the whole country. In the Bombay Presidency, of a total area of nearly 79½ millions of acres, only about three-quarters of a million acres are irrigable from Government works; but here also there is irrigation on an extensive scale from private works, particularly from reservoirs. Altogether the irrigated area cannot exceed 1½ or 2 per cent. of the Presidency, and even this approximate estimate is based on the assumption that the works under construction in 1882 are now in operation. Of a total area of 89½ million acres in the Madras Presidency, only 2,620,000 acres, or less than 3 per cent., was irrigated from public works in 1878, and though irrigation from private tanks and wells is very extensively practised, it would in all likelihood be safe to assume that the area irrigated from all sources does not exceed 5 per cent. of the total area of the Presidency. India. Proportion of irrigated land in India.

According to Mr. Deakin's Report on Irrigation in America, the great arid tract comprised in the south-western portion of the United States is one million square miles in extent, and of this not more than 3 or 4 per cent. can be irrigated at any price. The probable area irrigated during the year is estimated by Mr. Deakin at 2½ million acres, which is less than the two hundred and fiftieth part—or in other words two-fifths per cent.—of the area in which irrigation is required. Proportion of irrigated land in America.

Summarizing these facts, we find that in countries where irrigation has been practised for centuries, and in which the results of irrigation are considered to be of great national importance, the actual area irrigated in an average season is from 1 to 5 per cent. of the total area, while in the United States it is not nearly the one-thousandth part of the whole country, and only about the two hundred and fiftieth part of the area requiring an artificial supply of water for raising crops. Such facts as these should be borne in mind by those who are disposed to underrate the value of irrigation in New South Wales. Proportion of irrigated land in different countries.

When considered in its relation to possible famines land in Upper India is generally classed as "irrigated," "protected," or "unprotected." The "protected" areas are those which though not irrigated are so near to the irrigated districts as to place the people and the stock beyond the reach of famine. In the North West Provinces and Oudh the system of irrigation is so complete that the whole country may be classed as irrigated or protected. On the other hand, even the best portion of the Punjab, that is the part lying between the Indus and the Jumna, is irrigated Protected areas.

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and protected to only one-third of its extent. In New South Wales, although private enterprise has in a few cases initiated arrangements for providing against drought by irrigation, the great national importance of a comprehensive system of protected areas is not sufficiently understood or appreciated.

Irrigation experiments in New South Wales.

The few pastoralists who have irrigated land in this Colony, for the purpose of growing lucerne and other fodder plants, have obtained heavy crops, but the experience which has been gained in different districts has not been made the subject of close observation and record; and hence there is no means of accurately exhibiting in figures the crops obtained, the quantity of water applied, and other conditions under which the cultivation has been carried on. Mr. George Mair has irrigated on a small scale at Groongal for the last four or five years, throwing the water over the land by means of pumps, which draw their supply from the Murrumbidgee. Without preparing the land for irrigation he has been able to obtain crops of hay, wheat, oats, maize, and English grass, but has made no calculation as to the profitableness or otherwise of irrigation. Without irrigation he could not be sure of getting any crop, unless in a season exceptionally good, but with irrigation he is sure of a crop. This year he has a fairly good crop on 40 acres of irrigated land, while the seed sown at the same time on land which was not irrigated has not produced any crop whatever (Q. 2065).

Irrigation at Hay.

Another instance of irrigation of a different character, in the same district, is given by Mr. John Andrew, of Hay. Mr. Andrew says that nearly every householder in Hay irrigates to a small extent, and now there are beautiful gardens full of flowers where before nothing would grow. The streets have been planted with shade trees, the growth made by some of which has been very rapid, owing to the town water supply, and now some of the trees are large enough to allow 100 men to stand under the shade of a single tree (Q. 2350). Of still more importance, however, is the information supplied by a gentleman owning extensive property in the neighbourhood of Hay, and who has visited some of the irrigated districts in Spain. This witness (Qs. 9776 and 9810), speaking from his own experience, states that the successful irrigation of fruit trees, and particularly olive trees, in the Hay district has been placed beyond question, and that the yield of one of his olive trees was four times the average yield of the trees which he saw in Southern Europe.

Irrigation from the Namoi.

Turning to the north-west we find another instance of irrigation at Gunnible, 5 miles from Gunnedah, where, upon the banks of the Namoi, Mr. T. P. Wills-Allen erected in 1876 a 30-h.p. stationary engine, primarily for the purpose of sheep-washing. After it had served the purpose of sheep-washing the water was allowed to flow over the land, but the soil was not specially levelled for irrigation. Last year Mr. Wills-Allen obtained 80 tons of wheaten hay from 25 acres of land. He also irrigated a crop of lucerne, and between November, 1884, and the date of his examination before us (11 May, 1885) he had obtained five cuttings, each cutting averaging about 1 ton per acre. After the crop of wheat was removed the land was planted with maize, in January this year, and the result has been a crop estimated at fully 40 bushels to the acre, in addition to a luxuriant growth of pumpkins grown among the corn. The land was not selected for the purpose of cultivation, but was used because of its nearness to the wool-washing plant, and in point of fertility is rather below the average of the district. There was not £50 expended in preparing or clearing the land for irrigation. Without irrigation, Mr. Wills-Allen is perfectly sure that in the season through which we have just passed the land would not have returned the seed. He further says: "My success has been assured within the past six months. I have been practically irrigating for only six or eight months, and the result has been so thoroughly satisfactory that I have not the smallest doubt as to the issue." He is of opinion that each separate irrigation of the soil for agriculture is worth from 5s. to 10s. per acre. He is preparing to extend the area under irrigation, and hopes to be able to preserve 2,000 tons of hay, which he believes will place him beyond the danger of drought (*Evidence*, pp. 161,164). The proprietors of Burburgate, a pastoral holding of about 300,000 acres, about 7 miles from Gunnedah, are making preparations for the irrigation of

170 acres, upon a systematic plan, and they purpose to include an area of 2,000 acres within the scope of their operation (Q. 4337, 4339).

Importance and value of irrigation.

We attach the greatest possible importance to the results of operations such as these, as indicating the commencement of a new era of pastoral and agricultural prosperity. The fact that in the dry districts of Victoria some capitalists are preparing to irrigate to the extent of from 2,000 to 10,000 acres for pastoral purposes shows that irrigation has already passed beyond the stage of mere experiment in these Colonies; and we anticipate that the public will soon become sufficiently alive to the importance of the subject to insist upon the conservation of all the water which can be spared for the purpose. The fact that twenty-one farmers near Kerang have, by voluntary association, brought water sufficient for the irrigation of 3,000 acres for a distance of 13 miles also affords an illustration of what might be accomplished in numerous parts of the Colony by small communities of farmers settled on the banks of creeks and rivers capable of affording the requisite amount of water storage. There is ample evidence to show that water for irrigation would be well worth £1 per acre per annum for farming purposes; and that, in such districts as Gunnedah and Narrabri, those who have attempted cultivation, and now lead a nomadic sort of life as wool-carters and sheep-shearers, must, without irrigation, be starved off the land. Mr. Dewhurst and other witnesses say that all the farms along the Cockburn could be irrigated to some extent, that the value of the land would be threefold (Q. 3,828), while Mr. A. Rogers says that some land which is now worth £2 per acre would, if irrigated, be worth £30 or £40 per acre. (Q. 3934.) In the present state of information and experience we are not disposed to accept statements of the value of water as being arithmetically accurate, but as proof of its great importance they are beyond dispute.

Lucerne.

Lucerne is no doubt the most valuable fodder crop which can be grown in this Colony. Mr. H. B. Wright, writing from Winbar, near Louth, on the Darling, says:—"We have about 7 acres here irrigated, 6 under lucerne. I sowed it on the 4th of May, 1884, and have watered it six times, giving it about equal to 6 inches of rain each time, and have cut five good crops of it during the twelve months. I have also tried sorghum, oats, and prairie grass, but the lucerne is by far the most profitable." In this connection it may not be amiss to turn to the experience of America, under conditions of soil and climate similar to, although perhaps less favourable than, those which obtain on many of the rich alluvial river-flats of New South Wales. Mr. Deakin, in his report already referred to, says:—

A prevailing misconception as to irrigation is that it is employed only for small areas under high culture. The fact that great stock-growers in California, such as Messrs. Haggin and Carr, or Messrs. Miller and Lux, irrigate thousands of acres for stock purposes appears to be lost sight of. Much Mexican irrigation is carried on upon the same plan. Where the great landowners have their immense estates, one can see not hundreds but thousands of acres artificially watered; and where smaller proprietors enjoy a share of the coveted irrigable area they cultivate so closely to each others borders that the fenceless area as far as the eye can reach appears one gigantic irrigated field. * * * * On the great cattle and sheep ranches of New Mexico the proprietors, some of them Australians, are enlisting the same invaluable ally in order to protect themselves against the occasional ravages made in their flocks and herds by bad seasons. It pays, as a rule, to irrigate natural grasses, for by this means the carrying capacity of land is increased 33 per cent. The Chowchilla Canal, in Fresno County, Cal., 30 miles long, 30 feet wide at its mouth, and 2½ feet deep, is used almost solely for this purpose, and there are 20,000 acres of natural grass land irrigated in one property in Kern County.

Alfalfa.

But the mainstay of the American stock farmer, large and small, is lucerne, there styled alfalfa, which, though unsuccessful in England, is highly prized in France. In every western State this is grown to profusion. There are 35,000 acres of it grown by irrigation at Bakersfield. In Yolo county, Cal., almost the whole of the 13,000 acres watered from the Woodland Canal is under lucerne; it is to be found upon almost every colony plot in Southern California, and is the surest source of revenue in Utah and New Mexico. The area planted with this crop is increasing with marvellous rapidity. It is said to carry ten sheep or even twenty sheep to the acre, if it be cut for them. It is not a new growth in Victoria, but without irrigation its marvellous qualities have only partially developed themselves. At Dookie, with only the natural rainfall, it can be cut but once a year, yielding about three-quarters of a ton to the acre; while at Bacchus Marsh, with irrigation, or water within reach of its roots, it can be cut five or six times, yields seven or eight tons, and lasts fifteen to twenty years There are some 300 acres of it in this locality, thriving upon a natural seepage, and though rather delicate in its earlier stages, owing to the lack of irrigation, when once firmly rooted it raises the value of the land to from £50

£50 to £75 per acre. It is sown broadcast and freely, with a little wheat, oats, or barley mixed in it; it is rarely manured, though better for an occasional scarifying and top-dressing; is never fed down, but cut early and often, and found to possess splendid fattening qualities. It has succeeded just as well, but upon a much larger area, on stations south of Ballarat. It is said that it has been grown on the flats of the Hunter, N.S.W., for many years without replanting, yielding a regular and heavy crop, and that in parts of Queensland it is employed for fattening store stock with excellent success. This latter practice has been reduced to a system at Watrous, N. Mex., where not only are the cattle sustained upon it during the few times in the year when the ground is covered with snow, but store stock are fattened for market at any season by stall-feeding them with 40 or 45 lbs. of lucerne per diem, the average gain in weight per beast being set down at 3 lbs. per day. It pays well, therefore, to buy stores at from £4 to £6 apiece, and sell them again in three months at £14 or £15. Under irrigation, lucerne seems to flourish everywhere, particularly in sandy loam, and in a warm climate free from frost, and, though the yields given vary, they are all great. Three cuttings are sometimes obtained in the first year, making a total crop of 4 tons to the acre, but the general thing is, as in Utah, to obtain only one crop in this period. After this 6 tons is expected in the second year, and 8 to 12 tons in the third year. There are poor soils where it is cut only twice or three times, and other soils on which its quality does not keep pace with the quantity, but on those that most resemble our own plains the cutting is rarely less than four times, and the yield generally over 10 tons per acre in the course of the year. It can be sold, at 28s. a ton, at a profit of from £5 to £10 per acre per annum. Much higher profits than this have been made from lucerne in Victoria, but even under competition the net returns should be at least as high. The lucerne field is said to be green a week after it is cut, and knee-deep five weeks later. The crop presses well, and improves by keeping, lasting for three years, though losing a large percentage of its weight when turned into hay. One of its advantages is that it thoroughly cleanses and restores exhausted soils without manure, and thus is of special value as a rotation crop. Some authorities in America consider it difficult of eradication, while others maintain that with a thorough cutting of the roots about 3 inches below the surface it can be entirely destroyed. In some districts it is considered judicious to plough it in about every seven years. It can absorb a large amount of water, and will send its roots many feet in search of moisture. In Utah it is found best to sow as much as 30 lbs. of seed to the acre, but the average is from 8 lbs. to 16 lbs. elsewhere. At present there is an excellent market for it on every hand, as many farmers consider one acre of it better than any two acres of the best blue-grass land of the famed Ohio Valley. It is claimed for irrigated lucerne that it will carry one or even two beasts to the acre on land which, without the water, would not carry a beast to 20 acres, and that with fertilization its capacity is doubled. It stands first in the popular esteem, but is not by any means the only grass irrigated, red top, timothy, and clover giving excellent results as well, while, in the opinion of some, Arabian millet surpasses all. A natural grass known as alfileria (Spanish alfilerilla) is so very highly prized for its nutritious and drought-resisting qualities that a supply of the seed is being secured for the Experimental Farm, in order to admit of its acclimatization upon our own arid lands, on which artificial waterings cannot be looked for. It should lend an impetus to the great stock interests of Australia to be reminded that their rivals in America are making almost as much use of irrigation as the agriculturalists.

Artificial feeding.

It has been ascertained beyond all doubt that 1 lb. of hay per diem will keep a sheep in fair condition during the summer months if near water and not compelled to walk any great distance. We think we have good reason to assume that the produce of an acre of land under irrigation would yield five crops in the year, and, making allowance for shrinkage into hay, we put the produce of each cutting of lucerne at 20 cwt., or a total yield from one acre per annum of 11,200 lbs. Putting the worst case possible—that there was no natural herbage of any kind available—it would appear from this calculation that the produce of 321 acres of land under lucerne, properly irrigated, would be sufficient to supply 10,000 sheep with food, at the rate of 1 lb. per diem for a period of six months. We believe, however, that we have under-estimated the produce of the land under the conditions referred to; and that we are justified in concluding that the terrible mortality in stock which now periodically afflicts the country can be averted by a wise and prudent use of the water at our disposal. In the report of the Victorian Royal Commission on Water Supply it is stated that "at Bacchus Marsh lucerne, with irrigation, or water within reach of its roots, can be cut five or six times, yields seven or eight tons, and lasts fifteen to twenty years."

Ensilage.

The system of preserving fodder in a green state, known as ensilage, is one which promises to confer important advantages on the stockowners of the Colony; and although it has no necessary connection with the growth of crops by means of irrigation, it nevertheless would be a most valuable supplement to any such attempt to make provision for the feeding of cattle against the exigencies of an irregular climate. It sometimes happens, following a copious rainfall, more particularly after a year of flood, that the natural grasses grow so luxuriantly as to form extensive meadows which, if mown and stored in pits from which the air and moisture are excluded, would retain their nutritious properties in a greater degree than if converted into hay, and for a considerable period—there is reason to believe for many years. Almost every description of fodder plant has been successfully preserved in this manner,

manner, either whole, or, in the case of thick-stemmed plants, cut into chaff before being thrown into the silo. The longest period of which we have any information of ensilage having been preserved is four years, but, in the absence of experiment to test the point, there is no reason whatever to place that as the extreme limit at which green fodder so stored will retain its nutritive properties. All descriptions of graminiverous animals will eat ensilage as readily as hay; and the rapid extension of the system adopted by M. Goffart (who preserved 250 tons of green maize by means of pits in 1874,) throughout France and the United States of America, is proof of its value. The simplicity and economy of the means to be adopted should form a strong recommendation of it in a country where labour is often scarce and dear, and presumably the dryness of our climate furnishes a special reason why ensilage pits or silos should be availed of by agriculturists and pastoralists here. Mr. Walter Lamb, of Woodstock, Rooty Hill, who has given considerable attention to the subject, and who has enjoyed the advantage of inspecting the silo constructed by the Viscount Arthur de Chezelles of Chateau Boulleaume, Liancourt, St. Pierre, Oise, France, regards that as the largest and perhaps the most perfect of its kind.

Mr. Lamb's experiences.

Mr. Lamb, on his return to the Colony in 1883, proceeded to construct a pit, and the experience which he has gained in so dealing with the harvest of 1884 was so satisfactory that he has been encouraged to extend his operations, and he strongly recommends the adoption of ensilage pits to the farmers and pastoralists of the Colony. From the want of opportunity we have not been yet able to procure Mr. Lamb's evidence on the subject, but, in response to our inquiry, that gentleman has obligingly placed some notes at our disposal from which we quote the following:—

"When commencing to construct the Woodstock silos a mistake was made in adopting the European system of lining, experience having proved the same to be unnecessary in this dry climate. Even if a slight penetration of moisture occurs, the damage is trifling compared with the heavy expense of lining. My present plan is to select, if possible, the top of a hill, cut right through from one side to the other, so that the road into the silo at either end is slightly lower than the bottom of the silo. As the earth is excavated it is placed on the top of the banks, thus raising the sides about the same height as depth of excavation. In this way it will be found a 5 feet excavation will form a silo 10 feet deep.

"The silo being thus constructed with a fall at either end, internal drainage is provided for. It is, however, necessary to form a drain outside to remove any soakage that would otherwise find its way into the silo. A narrow surface drain 6 inches lower than the bottom of the silo will answer the purpose.

"The excavation work at Woodstock is all done with plough and scoop, worked by a team of ten bullocks, consequently the cost is reduced so low that I can find hardly any record of silos costing so little per ton of ensilage; thus, a silo to hold 100 tons can be constructed as under particularized:—

	£	s.	d.
Excavating 50 ft. × 12 ft. × 5 ft., which will make a silo 50 ft. × 12 ft. × 10 ft. = 111 yards, @ 6d. per yard	2	15	6
Double paling fence at each end	2	8	0
50 sheets of galvanized iron, to cover (say) ⅔ of a ton, at £22, or 4s. per ton	14	13	4
	£19	16	10

"If bark be used instead of iron the cost can be reduced to £10, or 2s. per ton.

"The silo being ready, the fodder is cut in the most economical manner, none more so than with the ordinary horse mower. It is thrown into the silo either whole or cut into chaff. With grasses the former plan is recommended, but when dealing with maize, sorghum, or other thick-stemmed fodder, chaffing is considered necessary. As thrown into the silo the fodder should be laid evenly, and when the accumulation has reached the thickness of 18 inches or thereabouts horses or cattle should be driven round and round, or rather up and down the silo, until the hitherto loose mass becomes almost solid, special care being taken that more pressure or treading be given to the sides close into the wall than to the other parts. Where there exists difficulty in getting animals into the silo, men must be substituted—on no account must the trampling be neglected.

"Excepting for economy's sake, there is no necessity to fill the silo rapidly; on the contrary, delay is recommended to allow the mass to settle down. Although it is customary in many cases to place first a layer of straw, then planks, afterwards earth, then again weights on the top of all, I have found the method successfully adopted by Viscount de Chezelles quite sufficient for all purposes. I simply throw on top of the fodder 2 feet of dry earth or less, where I have heavy produce or material requiring storage room in the same shed. This simple process of covering, excluding air, and pressing, all with the same material, overcomes difficulties which appear to be causing some trouble in England.

"My method of closing the ends is simply to erect a double paling or slab fence. Two strong posts are let into the ground at bottom of the silo; slabs the exact width are placed inside horizontally, not necessarily fastened, because the pressure of the fodder keeps them in their place; outside the posts slabs are nailed. Thus a cavity is formed, which is filled with earth and the air effectually excluded.

"All the covering required to keep out rain-water consists of sheets of iron or bark, simply placed on top of the earth, with stones or logs of wood to prevent their blowing off. Over my Woodstock silos, large sheds, used for hay, &c., answer this purpose, but at Merilong (Liverpool Plains) the former less expensive method will be adopted. "My

"My experience extends only to maize, sorghum, barley, and oats, but from all accounts, lucerne, clover, vetches, rye, trefoil, and all sorts of grasess are suitable.

"The best condition for ensilaging all sorts of fodder is during the flowering stage, when they possess the most nourishment. They should come away from the field as quickly as they are cut. In case of rain there need be no apprehension of damage.

"Salt, although sometimes used, is unnecessary for the purpose of preservation, nevertheless a slight sprinkling over coarse inferior grass may prove beneficial."

Vegetable production.

The conditions of climate and soil in this Colony favour the cultivation of all the vegetable productions of temperate and semi-tropical countries, if only water can be had at the right time and in sufficient quantity. Were there room for doubt on this point, we need only point to the luxuriant gardens which the Chinese have established in every part of the Colony. A little reflection upon the great range of our agricultural and horticultural industries will show how vast are the capabilities of the Colony, for the production of wine, dried fruits, tobacco, and other high-priced commodities which are in demand in all parts of the globe, as well as for maize, wheat, and other grains, which being less valuable in proportion to bulk, do not afford so large a margin for profit, owing to the cost of transportation. Our agricultural and fruit-growing industry falls far short of meeting the demand for our own consumption, as may be seen by the excess of imports over exports, and there is ample room for the employment of a very large population to meet the present food requirements of the Colony.

Excess of imports over exports.

The subjoined Statement of the Imports and Exports of Breadstuffs, Feeding Grains, Fruit, &c., for the five years ending 31st December, 1883, shows an excess of imports over exports to the value of £4,939,888 for five years, or a yearly mean of £987,977·6 :—

Article.	Imports.	Exports.	Excess of Imports.
	£	£	
Arrowroot	19,166	346	
Bran and pollard	116,212	20,799	
Butter	221,005	144,694	
Cheese	38,859	26,440	
Flour and bread	2,214,422	94,246	
Fruits, dried	487,305	nil	
„ bottled	17,545	nil	
„ green	396,798	488,655	
Wheat	515,435	67,709	
Barley	68,090	1,261	
Oats	344,551	5,644	
Maize	54,290	397,695	
Maizena, or corn flour	17.627	9,719	
Beans	2,347	nil	
Pease (dried and split)	9,040	75	
Sharps	5,195	nil	
Hay and chaff	420,699	20,919	
Jams and jellies	457,546	1,687	
Oatmeal and groats	117,916	345	
Pearl barley	8,894	nil	
Potatoes	678,692	30,504	
Sago	3,315	nil	
Tapioca	35,677	nil	
Total £	6,250,626	1,310,738	4,939,888
Yearly mean £	1,250,125·2	262,147·6	987,977·6

Future agriculture.

When the element of risk is eliminated from farming, as it may be to a great extent, by irrigation, and the husbandman is assured of the fruits of his labour with almost as much certainty as an artisan receives the wage for which he hires, we may expect that agriculture will be undertaken upon system and with success. The copious rainfall over the coast districts and the large amount of rich alluvial soil along the courses of the rivers seem to invite co-operation on the part of an agricultural population to bring about as great an improvement as that which is obviously possible.

Irrigation will probably be resorted to slowly in the first instance, but once its great advantages are made known by experience in any locality it may be expected that the demand for water will exceed the power of supply. After the construction of an irrigation work, it must be expected that some time will elapse before its capabilities are availed of to their full extent. At first the direct returns from irrigation works will probably be unremunerative, as they have been in almost every other country; but, as the management of water and its advantages become better understood, the revenue will here as elsewhere increase, and the ultimate profit of properly designed works of this description will be assured. It should however be clearly borne in mind that the direct returns from irrigation works are sometimes of much less importance than the indirect returns. The latter are due to the increase in national wealth caused by the increase of production, and their immediate consequences are apparent in enhanced value of the land, increase in railway traffic, and promotion of settlement. In India, where one of the most important taxes is that on land, this indirect return is more easily estimated than it could be here. Cultivators there readily pay double or treble the ordinary land revenue in addition to the water rate when water for irrigation is supplied. It is, however, perhaps not expedient that we should anticipate difficulties or a condition of things which has not yet arisen, further than to say that, in the apportionment of water for irrigation, consideration must be had for the fact that it will sometimes happen that the rainfall for a period of three or four years in succession may fall below the average. Provision must be made for that contingency, and care must be taken that the abundant water storage of one year shall, to the extent available for irrigation, be spread over a reasonably long period, such as experience would soon indicate.

Profits from irrigation progressive.

The perpetual snows of India and of Northern Italy constitute immense storage reservoirs which provide a liberal supply of water during the hottest part of the year. The absence of perpetual snows in New South Wales involves the necessity of conserving water on the largest practicable scale, so as in some measure to equalize the supply and provide for droughts.

Irrigation from storage reservoirs.

Southern India, Ceylon, and Spain are countries in which the circumstances in this respect correspond with those of New South Wales, and in each of which storage reservoirs have been resorted to to a large extent. An official return prepared for the Ceylon Government in 1867 showed that in that country there were then 4,900 irrigation tanks and reservoirs. In the Bombay Presidency the capacity of the reservoirs constructed by Government before the year 1882 was 10,269 millions of cubic feet, and the area irrigable from them was 143,000 acres. If the reservoirs then under construction be included the total capacity was 26,416 millions of cubic feet, and the total irrigable area 782,000 acres. This takes no account of the works constructed and maintained by the landowners. In the Madras Presidency the number of irrigation reservoirs is enormous, and the capacity of some of them is very great. One of these reservoirs, or tanks as they are there called, contains 3,000 millions of cubic feet of water, and has an area of 9½ square miles. In Mysore the number of irrigation tanks is over 20,000.

Storage reservoirs in various countries.

The irrigation done from a reservoir may seem small, but the proper and practical view of their results is that every reservoir represents a protected area. In Madras, where the principal crop irrigated is rice, which requires a very high supply of water, it is reckoned that every cubic yard of capacity in a tank represents a square yard of highly cultivated land. The quantity of water required for one crop of rice in Madras would be ample for three crops of lucerne in New South Wales. Private enterprise has already done much in providing water for stock throughout the interior of the Colony; but the storing of water on an extensive scale for equalizing the flow in our rivers, for the combined purposes of stock and irrigation, has still to be initiated. Mining enterprise has shown at Kiandra what can be done by a private company in storing water for mining purposes, and though in many places very complete provision of drinking-water for stock has been made by the owners and lessees of land (as, for instance, by a firm on the Gwydir, who, by pumping water through 30 miles of channels, are

Considerations of the importance of reservoirs.

are able to stock country otherwise waterless) the storage of water for irrigation purposes can scarcely be said to have commenced. The most economical works of this description are in those cases where large bodies of water can be conserved by dams of moderate length, and where large holding capacity is combined with great depth of water. That these conditions are not wanting in this Colony has been shown in regard to the upper portions of the Murray, Murrumbidgee, and Namoi. Favourable sites for great storage reservoirs are said to be found on the Upper Macquarie; and they probably exist on those portions of the other rivers which lie in a hilly country. The creeks and ana-branches of the rivers, while in many cases capable of extensive use for holding supplies of water for stock, are in only a few cases of sufficient depth and capacity to admit of their use for irrigation purposes. Their functions, as a rule, in connection with irrigation will be as inundation canals.

Facility for storing flood-water.

We have seen that along the course of the Darling remarkable facilities are afforded for storing flood-water. Ana-branches and creeks capable of holding large supplies abound on both sides of the river, and numerous lakes of great holding capacity are found in the neighbourhood of the river, especially from Louth to the junction with the Murray. Arrangements for filling these lakes and maintaining a supply in them can in many cases be carried out at a very moderate cost. This has in fact, in some cases, been done already by private enterprise and with most beneficial results. As a rule water stored in this way will probably be used more for stock purposes than for irrigation, but by acting on the principle that all the water not required for the former purpose should be utilized for the latter, much can be done to provide for the exigencies of bad seasons. It will seldom happen that irrigation done under such circumstances can be conducted by gravitation alone. Pumping will be required; but the lifts will as a rule be much less than in those cases where irrigation is now being done by pumping on the Murrumbidgee and other rivers, and the quantity of water raised with the same power will be greater in a corresponding degree. As irrigation with the higher lifts is remunerative, the advantage of irrigation under the circumstances described will be apparent.

Quantity of water used for irrigation.

The irrigation now being carried on in the Colony by means of pumping is, as a general rule, conducted in a very primitive manner so far as regards the distribution of the water, and without any preparation or levelling of the soil. The immediate result of this is that the quantity of water used is out of all proportion to actual requirements. In Colorado, where, as in Australia, irrigation is in its infancy, it has been found that as much water is frequently used for one watering as would be equal to a depth of 12 inches over the entire area irrigated. In the few cases in which irrigation has been done by gravitation in this Colony similar waste has occurred. As a general rule, the irrigation practised in New South Wales has consisted in pumping water from the rivers and using it in fruit or vegetable gardens, or for wheat, and other cereals, and for lucerne. It is natural to suppose that water made available under such circumstances would be used economically; still the waste of water in this Colony wherever irrigation is practised is very great, and is due entirely to disregard of first principles in the management of the distribution. In the proceedings of the Royal Society of New South Wales for 1883 there is a paper by Mr. H. G. McKinney, C.E., on the subject of irrigation in Upper India, in which a concise description is given of the system of distribution adopted there. Briefly stated, this system is to have distributing channels proceeding from the main and branch canals, and to fix the outlets for the smaller water-courses at such places in either side of these distributaries as may be deemed advisable. The small water-courses leading from the distributaries to the field have to be constructed and maintained in an approved manner by the cultivators. To ensure regularity in the times of irrigating various crops, an irrigating period is arranged for different lengths of each distributary or for the whole distributary. The irrigating period on one distributary or portion of a distributary corresponds with the non-irrigating period of another distributary or portion of a distributary, and in this way is utilized the supply flowing in the canal. The practical results obtained by care in the distribution of the water are shown by the duty in acres obtained from a flow of 1 cubic foot per second.

Economical distribution of water for irrigation.

second. The following are the results obtained in various countries, reckoning in this manner :— Results.

India—Ganges Canal	240 acres
India—Eastern Jumna Canal	250 „
France—Marseilles Canal	70 „
Spain	140 „
Italy	84 „
Colorado	50 „

Duty of water for irrigation.

The conditions as to rainfall, nature of crops irrigated, temperature, and length of irrigating season all influence the area which one cubic foot per second will irrigate. It may therefore give a more definite comparison if the quantity required for one watering is stated. While, as already mentioned, as much as 12 inches in depth has been given in Colorado at one watering, 3 inches is considered an ample depth in Spain and Egypt, and from 3 to 5 inches in India, the latter quantity being allowed as a maximum at the first watering of dry ground. These figures agree closely with the quantities of rainfall required to saturate the ground on the plains in the interior of this Colony. It is frequently reckoned that in late spring or summer a fall of less than 3 inches is insufficient to reach the roots of the grass or produce a good crop. The rainfall in the interior of this Colony is meagre and uncertain, even when compared with that of countries where irrigation is most extensively practised.

Rainfall in irrigated countries.

Among countries whose climatic conditions bear more or less resemblance to those of New South Wales the most interesting in connection with questions relating to rainfall and irrigation are Spain, Italy, Southern France, India, California, and Colorado. In Valencia the main rainfall is about 16 inches, and this appears to be about the average for the greater part of Spain. It is owing to the fact that but a small proportion of this rainfall takes place in the seven irrigating months from March to September that irrigation in that country is so necessary. Under the most favourable circumstances not more than one crop in two years is obtained from unirrigated land, while from irrigated land two or three crops in one year are reaped. In New South Wales five and six crops of lucerne could be grown in the year. In regard to Italy, although the mean rainfall in Piedmont is 37 inches, the period of fall is so unseasonable that extensive irrigation works have been carried out.

South of France.

In the south of France the rainfall varies from about 12 inches to 27 inches in the irrigated districts. As in Spain and Italy, this amount of rain does not give a correct idea of the necessity for irrigation. In the irrigated districts in France it frequently happens that during the hottest months, namely, June, July, and August, there is not one good shower of rain, and the rains in Spain are even more uncertain and more unseasonable.

India.

In India the great extent of the country, and the different causes which affect the rainfall in different parts of it, naturally produce very considerable differences in the quantity of the rainfall and in the seasons in which it takes place. In the North-west Provinces and the Punjab the rainfall for some distance from the Himalayas is so regular and so plentiful that irrigation is unnecessary; but the amount of rain rapidly diminishes in the latter according to distance from the mountains. Thus, at Kangra, on the slopes of the mountains north of the Punjab, the mean annual fall is 115 inches, while at Gurdaspur, about 30 miles from the foot of the mountains, it is only about 31 inches, and the diminution is further shown by the respective falls at Amritsar, Lahore, and Multan, which amount to 20 inches, 15 inches, and 6 inches, the respective distances from the foot of the mountains being about 70, 100, and 350 miles. In the irrigated districts of the Punjab the mean annual rainfall varies from 6 to 30 inches, and in the North-west Provinces from about 15 to 40 inches, except in the Dehra Doon Valley, where irrigation is carried on with advantage, although the average annual rainfall is 88 inches.

Colorado.

The mean annual rainfall in the irrigating districts of Colorado is about 14 inches, while in California, according to Mr. Deakin's Report, the amount varies in different parts of the State from 4 to 40 inches; the latter being obtained in the

California. mountainous parts of Northern California, and the former in the arid districts in the southern part of the State.

New South Wales. Comparing these figures with the rainfall in New South Wales, we find that in this Colony the mean annual rainfall in the basin of the Darling, excluding the hilly portion, is only 12·81 inches. In the plain country between the Lachlan and the Murrumbidgee the rainfall is 16·33 inches, and in the corresponding district between the Murrumbidgee and the Murray, 14·56 inches. These amounts of rainfall would be sufficient for the production of ordinary crops of cereals if the rain occurred at the times when it is required; unfortunately the rule is that rain comes in such small quantities as to be of little or no benefit to vegetation. Evaporation from earth under ordinary circumstances is double that from water, and it has been found in India that with a hot wind blowing as much as half an inch has been evaporated from a water surface in twenty-four hours. Bearing these points in mind, what effect could be expected from an inch of rain falling on the heated plains of the west?

Rainfall and evaporation in regard to necessity for irrigation.

Methods of irrigation practicable. Private enterprise has already proved that in New South Wales two methods of irrigation are practicable. The first is by pumping from the rivers, and the second by making cuts from the rivers to flood the land by gravitation when the rivers are high. Works of the latter class are termed inundation canals. On all the important rivers of the Colony there are great facilities for the construction of works of this description. In the alluvial plains the slope of the ground is generally from the rivers, the highest ground being the river bank. The immediate result of this feature is that creeks leading from the rivers are numerous, so that when the floods rise these creeks act as distributory channels in carrying off the flood-waters. Notable instances of this are found on the Murray at and near Tocumwal, on the Murrumbidgee near Narrandera, on the Lachlan in the case of the Willandra Billabong, and on the Darling in the case of the Cato, Tarrion, and many other creeks. In the year 1877-78 the inundation canals of the Punjab irrigated over 537,000 acres. The outlay on these canals was small in proportion to the benefits conferred by them. They are seldom provided with permanent head works, and there are no dams across the rivers which feed them. The silt deposits are cleared out every year, and the supply depends solely upon the natural rise of the floods at the beginning of summer. The floods in New South Wales are irregular in their occurrence, and it cannot be expected that crops of cereals will be irrigated by means of inundation canals as in the Punjab; but the practicability of irrigating grass-paddocks by taking advantage of flood-water has been most successfully proved by Mr. James Tyson, junr., on his stations on the Lower Lachlan, and corroborated by others who have followed his example. Mr. J. L. Gwydir, who flooded two large paddocks with water from the Lachlan, found as the result that whereas these paddocks had failed to carry 4,000 sheep in the season before the flooding, in the succeeding season they successfully carried 12,000 sheep, 120 cattle, and over 200 horses.

Permanent canals. The highest class of irrigation is that practised on a regular system from permanent canals. Unfortunately, the only rivers beyond the Dividing Range from which canals of this description can be constructed are the Murray and the Murrumbidgee. Permanent irrigation canals from some at least of the rivers flowing into the Pacific on the eastern coast are quite practicable; but as the rainfall is greater and more regular than in the interior of the Colony the want has not yet begun to be so much felt. There is no doubt, however, that even on the coast district the question of irrigation will demand attention as population increases.

Canals from the Murray and Murrumbidgee. The practicability of constructing permanent canals from both the Murray and the Murrumbidgee is beyond question. In a report of the Engineer to the Commission it is pointed out that at a short distance west of Albury the hills cease and only open plains are met with; that there is a regular fall in these plains towards the west and north-west; and that the minimum discharge in the river is ample to guarantee a permanent supply for a large irrigation canal. It was also pointed out that if the water of the Murray were made available for irrigation its

its letting value might be reckoned at £200 for every cubic foot per second of discharge. With a canal discharging 1,000 cubic feet per second as proposed, the gross income from the water would be £200,000 per annum. The crop generally irrigated would probably be fodder, and considering that it has been stated by a witness before the Lands Inquiry Commission that 100 acres of hay will sustain 5,000 sheep for three months in a bad season, the enormous benefit conferred by such a canal is at once evident. The idea of constructing a canal from the Upper Murray to divert a supply into the Billabong Creek was suggested twenty years ago by Mr. W. C. Bennett, Chief Engineer for Roads. (In this connection, vide reports by Mr. F. B. Gipps, C.E., and Mr. H. G. McKinney, M.I.C.E., in Appendix.) The question is important, and can be settled only by levels and a survey of the intervening district. The question of utilizing the supply in the Murray by Victoria has been brought to public notice in that Colony.

Comparison between the Murrumbidgee and Murray.

As a source for a permanent irrigation canal the Murrumbidgee is inferior to the Murray, on account of its smaller discharge; but on the other hand, in the case of the Murrumbidgee, there are no intercolonial difficulties involved. From the levels which have been taken by the Railway and the Harbours and Rivers Departments, it is evident that the nature of the doab or district between the Billabong Creek and the Murrumbidgee is as favourable for the construction of canals as that between the Billabong and the Murray. There is a regular fall towards the west and south-west, there are no engineering or other difficulties as far as can be judged from the preliminary examination made, the soil is of excellent quality, and there is a good supply of water.

Storing flood-water on the Murray and Murrumbidgee.

Tantangara Basin.

Diversion of Snowy River.

The supply in both the Murray and the Murrumbidgee can be made more uniform by storing up water in the mountainous country near their sources and allowing it to flow into the rivers when the supply in them is low. A preliminary examination of the Upper Murray was made at our request, and it was reported that water can be stored there on an extensive scale; but this requires confirmation by a fuller examination. The facilities for storing water in the Upper Murrumbidgee appear more favourable. The Tantangara Basin, of which a survey was made under our instructions, is capable of containing on a low estimate 15,120 million gallons, a quantity which would supply 200 cubic feet per second for 140 days continuously to increase the summer discharge of the river. This basin is well worthy of further examination. There is also a proposal, originally due to Mr. P. F. Adams, Surveyor-General, to divert a portion of the water from the Snowy River to increase the supply in the Murrumbidgee. The Snowy River rises in New South Wales, and has in this Colony a catchment area of 3,360 square miles. The water from this area, which is all mountainous, is now entirely lost to the Colony, so that it is highly desirable that it should if practicable be utilized in the manner proposed. A survey of the country through which a supply would have to be carried from the Snowy River to the Upper Murrumbidgee was ordered by us, but it has not yet been completed.

Inundation canals.

Inundation canals are practicable on almost every important river in the interior of this Colony. As in the case of the inundation canals from the Punjab Rivers, the flood-water can in many places be drawn from the rivers without the expense of damming them. In a number of instances the natural channels from the rivers can be utilized as inundation canals, and under such circumstances the cost will be trifling compared with the advantages gained. In connection with the damming of rivers for the purpose of diverting the flood-waters, the Darling probably affords better facilities than any of the other rivers. The rocky bars found in it at frequent intervals would afford good foundations for dams, and the creeks and ana-branches would in some cases serve to a greater or less degree as canals. We are of opinion that the rocky bar forming the rapids at Brewarrina may be regarded as a proof that dams can be erected across the Barwon without silting taking place.

(9.) NAVIGATION.

Snagging.

The sum of £170,000 has been expended in improving the Murray, Murrumbidgee, and the Darling. The cost of "snagging" the Darling is about £45 per mile, while in the more thickly timbered country it amounts to from £45 to £60; on the former river about 12 miles per month are cleared; on the latter, about 5 miles. Vessels can now go up the rivers with from 3 to 4 feet less water than formerly, and can also travel at night. (Q. 1144.) Mr. Moriarty points out that the first step to improve the rivers is to remove the dead timber which has been accumulating for ages, and this cannot be done if the height of the river was raised. Operations on the Murray have ceased, and snagging is now confined to the Murrumbidgee and Darling.

Use of rivers.

The attention which the Engineer-in-Chief for Harbours and Rivers has been able to devote to the rivers of the Colony appears to have been wholly confined to the removal of obstructions to navigation; but now that railways have been extended at great cost to the Murray, Murrumbidgee and the Darling, and that subsidiary lines have been projected having their termini at points other than Bourke on the Darling, it may be well to consider whether the rivers should not, as the Commissioner for Roads puts it (Q. 1241), "be used in producing something to transport rather than in transporting it."

Locks.

To open the Murrumbidgee between Hay and Wagga, and the Darling between Wentworth and Walgett, for navigation by vessels establishing communication with Melbourne by way of Echuca, and with Adelaide by way of Blanche Town, it will be necessary to construct locks as well as weirs, and the cost of establishing through communication would be increased by the additional works required. If, however, the rivers are to be primarily considered as sources for water supply and navigation is to be regarded as an adjunct to the railways, the locking of the rivers would not be needed to the same extent, if needed at all, for a comparatively few weirs would create many miles of water-way which station-holders along the banks of the rivers could take advantage of for the carriage of their wool and return supplies to the nearest railway terminus. For this purpose vessels having a draught of from 2 to 3 feet would be built, as was done in the attempt which was made to keep open navigation to Walgett (Q. 5285.)

Traffic on the Darling.

The Census returns of population appear to include the whole of the population on the Darling in the registry districts of Bourke and Wentworth; and from these it will be seen that the population of the former district (into the heart of which the railway has already been taken) is one person to six square miles, while that of the latter (whose boundaries extend so far south as to include Euston on the Murray) is only one person to ten square miles. From the Report of the Collector of Customs for 1884 we observe that the Darling at Bourke has not been navigable for any but short periods since 1879. In 1880 it was "navigable for a short period"; in 1881, for a "very short time"; in 1882 the river "rose twice during the season"; in 1882 it was "unnavigable nearly the whole season"; and in 1884 it was "navigable twice, but of very short duration." The total value of the imports at Wentworth, upon which all the Darling trade is concentrated, during the five years ending December, 1884, was £1,872,439, and of the exports, £4,534,068, the annual mean value being £374,487 and £906,813 respectively.

Traffic on the Murrumbidgee.

This may be taken as representing the aggregate value of the trade of all the ports on the Darling with South Australia, the Victorian share of it being inconsiderable. Victoria, on the other hand, appears to enjoy almost a monopoly of the the river-borne traffic of the Murrumbidgee, which, for Customs purposes, centres at Hay. Mr. J. C. Bowden states (Q. 2959) that the depth of water in the shallowest places at ordinary summer level is from 1 foot to 1 foot 6 inches, and he has seen it year after year as low as that in numerous places. The river remains at summer level from January till the end of May at Balranald, and probably two months longer at Hay, so that navigation to Balranald is practicable for five or six months, and to Hay for four or five months. The aggregate value of the imports at Hay for the same period of five years was £71,267, and of the exports, £2,462,506, the mean annual value being £14,253 and £492,501. The railway was opened to Hay on the

the 4th July, 1882, and it will be seen from the following figures that there has been a steady and marked decline in the river-borne traffic to and from Hay since then:—

Year.	Imports.	Exports.
1882	£32,762	£489,081
1883	13,395	293,689
1884	6,591	160,386

Railway to Bourke.

The effect of the railway to Bourke upon the river-borne traffic of the Darling will, in all probability, be much more rapid and decisive than that upon the steamer traffic with Hay. The natural result of the present condition of things would be to extinguish the trade with South Australia, and transfer it to Sydney by way of Bourke. It will be of as much consequence to pastoralists to get their wool rapidly into the market, as it will be to merchants to reduce the amount of their unproductive capital. Vessels of a smaller draught than those which are anchored in the river, sometimes for nearly a twelvemonth, will probably be brought into requisition, to distribute the river trade to and from Bourke, or any other railway terminus on the river which may hereafter be created; and, in this way, there is reason to expect that communication, hitherto by an annual or semi-annual voyage to Adelaide, will be cheap, quick, and regular by rail with Sydney.

River traffic intermittent.

Navigation, as it has hitherto been practicable between the points named, has been very risky and intermittent. At intervals of years a steamer from Adelaide will arrive at Walgett, while almost the same may be said of Brewarrina. Under ordinary conditions it has been no uncommon thing for pastoralists to have had two or three seasons' clips of wool upon their hands, awaiting the arrival of the river barges to carry it to Melbourne or Adelaide. With the railway actually opened to Bourke, and the probability of other lines being constructed to points on the Darling to the south of it, it seems certain that railway traffic will wholly supersede the intercolonial river-borne traffic of the Darling, as the railway to Hay has to a great extent superseded that on the Murrumbidgee, where navigation is practicable for longer and more regular periods.

Railways preferable to water carriage.

In regarding the rivers as sources of water supply for stock and agricultural purposes we discover in them the means of bringing fertility to large tracts of rich but now unproductive soil along their course, and of vitalizing all the industrial capabilities of the districts through which they flow. Viewing them simply as highways for traffic, we anticipate that after a vast expenditure of public money the country adjacent to them will remain in pretty much the same condition as it is at present, with even its pastoral capabilities only partially developed, and that the sole result of that expenditure will be the transportation of what little wool a mere handful of people are able to produce, to colonies which contribute nothing towards the cost of the carrying facilities by which they are benefited. From the consideration which we have been able to give to the question, we are of opinion that railways will give all the facilities for carriage which are requisite, and that public expenditure upon the rivers of the southern and western portions of the Colony should be made with a view to increasing the means of conserving and distributing water over the dry districts through which they flow. The only exceptions which we should make to this rule would be that, if in any case it should be found that navigation can be adopted at a moderate expense as a means of feeding our railways without interfering with the interests of water supply, the works carried out on the rivers should be designed to suit both purposes.

(10.) PRINCIPAL RIVER BASINS AND OTHER DRAINAGE AREAS.

GENERAL REMARKS AND EXPLANATIONS.

In defining the outlines of the different river basins of the Colony, it has been found necessary to depart in several important instances from the ideas generally accepted as to what constitutes their drainage areas. In the first place, the fact has to be recognized that on the lower portions of the western rivers the bank on one

one side (sometimes on both) frequently constitutes the boundary of the river basin. Another point which has not hitherto been sufficiently recognized is that a large portion of the Colony is without a defined river system. Throughout that part of the Colony lying to the north of the Murrumbidgee and Lower Murray and to the west of the 148th parallel of longitude, not only is the proportion of the rainfall which reaches the river infinitesimally small, but there are important catchment areas entirely independent of the recognized river basins. The general description applicable to this part of the Colony is that it consists chiefly of immense plains more or less timbered, and varied with occasional sand ridges, but partly also of an irregular series of low ranges of hills, the course of what was probably important mountain ranges. In both cases the tendency of the natural features of the country is to prevent drainage into creeks or rivers; and when to this is added the fact that the rainfall generally varies from $8\frac{1}{2}$ to 15 inches, and that the temperature in the shade during seven months in the year probably averages a very high range, it is not surprising to find that there are immense areas which contribute absolutely nothing to the discharge of the rivers. Under these circumstances, the boundaries of drainage areas in the western portion of the Colony can only be fixed approximately. The boundaries of these drainage areas, though necessarily approximate, are sufficiently accurate for all practical purposes, for the instances in which most difficulty is experienced in fixing them are those where the rainfall and the surface drainage are smallest.

Small proportion of rainfall reaching the rivers.

Indefiniteness of western drainage areas.

Blue Mountains.

Closely connected with the question of river basins is the physical structure of the Colony. The Blue Mountains or Australian Alps, extending in an irregular line approximately parallel to the coast and with their highest ridge at a mean distance of about 75 miles from it, constitute a continuous divide between the coast districts and the rest of the Colony, the area of the latter division being about five times that of the former. The strip of low-lying land between the Dividing Range and the coast varies in quality according to the nature of the formations from which the soil has been derived, and the manner in which it has been formed and deposited, —the poor sandstone soil near Sydney reaching one extreme, while the rich basaltic soil near Kiama and the deep alluvial deposits on the banks of the Clarence, Manning, and Hunter Rivers representing the other.

Varieties of soil in the coast districts.

The western plains.

Their origin and formation.

On the western side of the Dividing Range there are extensive tracts of high table-land, with a gradual descent to the great plains, the latter constituting about two-thirds of the area of the Colony. With respect to the origin and formation of the western plains, the theory of Mr. Tenison-Woods and others qualified to express an opinion is that the red and yellow clays of the western districts were frequently formed by the weathering of the surface of granite, and in particular by the decomposition of the felspar and mica contained in it, while the quartz crystals, set free in the same process, were the origin of the sand ridges so frequently met with. The numerous isolated hills and low ridges of granite are described by him as the outcrops of the basis of the country. It is agreed by that gentleman and the Government Geologist that a mountain range extended across New South Wales from the vicinity of Orange in the direction of Cobar and Wilcannia, thence to South Australia, and that to the north and north-west of this range there existed a sea in which the water-bearing strata of the cretaceous period were deposited. Mr. Tenison-Woods is of opinion that at that period the country south of that range was a desert, the character of which was, in a subsequent geological epoch, altered by the outpouring of volcanic rock.

Old mountain range.

Change in the drainage system.

Beyond doubt the drainage system of the country has materially altered; but though in wells old river-beds have in some cases been met with, very little information has been obtained regarding the direction of underground currents or of percolation. The stream of all rivers flowing through the alluvial formation of our western plains represents only a portion of the discharge of the river valley, the balance, after allowing for evaporation, filtering through the soil beneath and on both sides of the rivers. The wells sunk in these alluvials tracts are affected more or less quickly by the rise and fall of the rivers according to the greater or less porosity of the subsoil; but in other cases, owing to the intervention of impervious strata, the

the wells remain unaffected by changes in the water level in the river. A number of witnesses, and particularly some of those who were examined at Narrandera and Jerilderie, stated that throughout a large extent of the district bordering on the Murrumbidgee, and lying between that river and the Billabong Creek, there is a remarkable uniformity in the nature of the wells. A small supply of water, generally brackish, is struck at depths of from 70 to 80 feet, and at depths varying from 120 to 200 feet, an apparently inexhaustible supply of good fresh water is met with. This fresh water rises rapidly in the wells till its surface is at the level at which the brackish water is met with, and it remains at that level whatever may be the height of the water in the river. The conclusion is that the source of this underground supply is in the higher parts of the Murrumbidgee basin, and that the intervention of impervious deposits near the river maintains for it the character of an independent flow.

True mean of rainfall in the Colony.

In his last annual report on the rainfall, the Government Astronomer, after giving the mean rainfall of the Colony as obtained from all the stations, adds the remark—"It must, however, be clearly understood that the average spoken of is simply the arithmetical mean of the rainfall at all stations, for at present it is impossible to obtain the exact average." As there are now 496 observing stations distributed over the Colony, and every large drainage area is well represented, a fair approximation to the mean rainfall in every basin can be obtained by using the results from only such stations as have observations for at least three years. We have in this manner calculated the mean rainfall for every principal drainage area. *The averages so obtained have placed us in a position to deduce the mean rainfall of the entire Colony, by using each average in proportion to the area it represents. The mean rainfall as obtained in this manner is* 18·66 *inches.* More extended observations and an increased number of stations will probably give a slightly different result, but we do not anticipate that the difference will be of any great importance.

Field for further investigation.

Before proceeding to a detailed account of the principal river basins it may be remarked that, while valuable service has been done for this Colony by geologists in connection with the question of underground supplies of water, there is still a very rich field for investigation and much new ground to be examined.

Catchment areas which are not drainage systems.

In dealing with these extensive tracts of country which do not belong, except in times of high flood, to any of the recognized river basins, it has been found convenient to consider them as catchment areas. It must however be understood that, owing to the small rainfall, the absence of well-defined natural features, the absorbent nature of the soil, and the high temperature, these areas are not possessed of any well-defined drainage system. Each of them, in fact, comprises a number of catchment areas. The tracts of country which come under this description are seven in number, namely:—

1. The basins of the Mirool, the Bland, and other creeks;
2. The Manara County District, lying between the Lachlan and the Darling;
3. The Yantara County and Bulloo District, in the north-west and north of the Colony;
4. The Tara County District, in the west and south-west of the Colony;
5. The Paroo;
6. The Big Warrambool;
7. The Narran.

Flow of rivers intermittent.

The basins of the Paroo, the Big Warrambool, and the Narran are of an intermediate type between the catchment areas mentioned and the permanent rivers. It is, however, an unfortunate circumstance that the flow of every river in the interior of the Colony, with the exception of the Murray and the Murrumbidgee, is intermittent. The great importance, therefore, of conserving water permanently is at once apparent, and an important function for future canals in this Colony is clearly

clearly indicated. This function is the filling of dams and storage reservoirs. In all the western basins the supply of water available is so small in proportion to the area requiring it that a thoroughly economical system of distribution is of the first importance.

THE COAST RIVER BASINS.

Area.

The most important river basins of the coast district are those of the Hawkesbury, Hunter, and Clarence, each of which has an area of more than 8,000 square miles. After these come the Macleay, the Shoalhaven, the Richmond, and others, the first of which has a catchment area of over 4,000 square miles, while those of the second and third are respectively about 2,800 square miles and 2,650 square miles.

Natural advantages of the coast district.

The most plentiful and most regular rainfall in the Colony, the most valuable deposits of coal, and some of the most fertile tracts of alluvial soil, combine with its geographical position to make the coast district more capable of supporting a dense population than any other part of New South Wales. Comparing the coast district with Northern Italy, it is found that while the mean temperature of the latter is 55° that of the former is about 63°; and while the mean annual rainfall in Northern Italy is about 37 inches, that of our coast district is only 35½ inches.

Irrigation more needed than in Italy.

It therefore appears that, judging from both temperature and rainfall, the necessity for irrigation in our coast districts is greater than in the part of Italy where irrigation is practised on a very extensive scale. There can be no doubt that the adoption of systems of irrigation in the basins of our coast rivers is only a question of time; hence, wherever possible sites for storage reservoirs have not yet been alienated they should be permanently reserved, and in all works undertaken in connection with the eastern rivers future irrigation works should be kept in view, and nothing should be done which would interfere with their success. Nor is the time distant when the question of irrigation in the coast districts will come prominently forward. This part of the Colony was the first settled, and is divided into the smallest holdings, the latter being an important circumstance in favour of the successful adoption of a system of irrigation; also, as already shown, a comparison of the temperature and rainfall with those of other countries points to the conclusion that irrigation can be resorted to with advantage. This is made clearer by a closer consideration of the following points:—

Variations in the climate.

Along a coast-line extending over 9 degrees of latitude there are naturally important differences in the climate. While on the whole the temperature of the coast district may be compared with that of Italy, the range of temperature throughout the year in the latter country is considerably greater.

Foreign comparisons.

As a mean of the whole of this part of New South Wales, it may be stated that we have the winter of Southern Italy combined with the summer of Northern France. While the variation of mean temperature in summer from the extreme north to the extreme south of the coast-line is about 8°—from 76° to 68°—the difference of rainfall is much more important. At Antony, situated at the mouth of the Tweed, the mean annual rainfall is about 64 inches, while that at some places in the basins of the Hunter and Hawkesbury is only about 19 inches.

Mean rainfall: Clarence, Hunter, and Hawkesbury Rivers.

The following table, which shows the mean rainfall in the basins of the Clarence, Hunter, and Hawkesbury during the hottest months of the year, furnishes useful data for estimating the agricultural capabilities of these districts:—

Basin.	October.		November.		December.		January.		February.		March.		Remarks.
	Rainfall	Rainy days.	Rainfall	Rainy days.	Rainfall	Rainy days.	Rainfall	Rainy days.	Rainfall	Rainy days.	Rainfall	Rainy days.	
Clarence	3·25	8	2·64	7	1·72	6	4·89	7	4·63	11	3·36	10	These figures are averages of five years.
Hunter	2·78	7½	2·39	7	1·22	4	1·68	4½	2·65	6	1·25	4½	
Hawkesbury	4·01	12	2·20	10	1·21	7	2·30	9½	3·30	10	2·15	10	

The

The conditions above shown are more favourable than are obtained in the irrigated districts of Spain and Southern France, but less favourable than those of Northern Italy.

Fertilizing nature of silt.

The fertilizing character of the silt carried down by the Hunter and the consequent beneficial effects of floods are well known. Irrigation from the Hunter would therefore have this important point in its favour, that to a certain extent it would supply manure as well as moisture to the soil. The valley of the Hunter is already widely known for its great yield of lucerne, which yield could be greatly increased by irrigation.

THE SNOWY RIVER BASIN.

Area.

The basin of the Snowy River, that is so much of it as falls within the Colony of New South Wales, may for all practical purposes be considered as including the whole area of the counties of Wallace and Wellesley, on the border of Victoria. The area of this basin is 3,360 square miles, and it has on its boundaries the highest mountains in Australia. On the eastern side of the basin is the Snowy Range, the summit of which, near Mount Kosciusko, widens out so as to form a table-land which extends for a length of over 20 miles, and which maintains an average height of 5,000 feet. Around this strip of table-land, which has an area of about 160 square miles, several peaks attain an elevation of more than 7,000 feet, the most important among them being Mount Kosciusko and Mount Townsend, whose heights are 7,171 and 7,256 feet respectively.

Height of peaks.

Rainfall at Kiandra.

The number of observing stations within the Snowy River basin is insufficient for forming an estimate of the mean annual rainfall throughout its area. The annual fall at Kiandra is estimated at 61 inches, while at two stations in the valley it is only 23½ and 18½ inches respectively. It seems highly probable that if there were an observing station on the eastern slope of the range, near Kosciusko, where the vapour-laden clouds from the Pacific strike on the hills, a much higher rate of fall would be registered than even that at Kiandra. The remarkable difference between the rainfall at Kiandra and that in the valleys below is in all probability due to the physical features of the basin. The centre of the basin is a deep valley, which is sheltered from the rain-clouds by the ranges on each side.

Snow-fall.

An important feature of this basin, and one which greatly enhances its value as a catchment area, is the fact that snow not only falls in large quantities in winter, but also at all times of the year at an elevation of over 5,500 feet. The snow melts in all exposed places as the summer advances, but occasionally, on the south-eastern slopes of the mountains, where it has been drifted in large quantity by the wind, it lasts throughout the year.

Effect of the snow-fall.

Discharge of river into Victoria.

The effect of the accumulation of snow in winter is to reduce the discharge of the river at that season and increase it in summer, thereby maintaining a more uniform flow throughout the year. The mean rainfall at the three observing stations, Kiandra, Bukelong, and Jindabyne West, is 34·41 inches; but bearing in mind that this is probably much below the actual average, and that from such a mountainous country a very high proportion of the rainfall runs off, there is little doubt that it would be safe to assume that 14 inches per annum over the entire catchment area flow off in the river. Under this hypothesis, the mean discharge throughout the year which flows across the frontier into Victoria is 3,700 cubic feet per second.

Comparison of temperature.

The mean temperature at Kiandra is only 45° Fahr., which is slightly lower than that of Dunfermline, in Scotland, and 2½° lower than that of Edinburgh; so that with a high rate of rainfall and a cloudy sky the rate of evaporation is necessarily low, and is probably balanced, or nearly so, by the heavy dews which prevail. Under these conditions, drainage, and not water conservation, is required for the development of the capabilities of the land. The diversion of a supply from the Snowy River to the Murrumbidgee would therefore be an

an actual advantage to the Snowy River basin, as well as an enormous benefit to the country depending on the Murrumbidgee. Having as its source the streams which flow down the eastern slopes of Mount Kosciusko, the Snowy River, though a rapid torrent in the upper part of its course, does not fall to an elevation of 3,000 feet above sea-level till it reaches the junction with the Crackenback Creek.

Diversion of Snowy River water into the Murrumbidgee.

The practicability of diverting a supply of water from this part of the Snowy River into the basin of the Murrumbidgee was first suggested by the Surveyor-General, Mr. Adams; and though positive proof has not yet been obtained, the balance of evidence available goes to show that such a work is at all events possible. While the total area of this basin from which the water flows to waste through Victoria to the ocean is considerably over 3,000 square miles, the portion from which Mr. Adams proposed to divert the surface drainage into the Murrumbidgee basin was only 258 square miles. These figures show at a glance the insufficient grounds for the objections raised in Victoria to the proposed diversion of the waters of the Snowy River. The quantity proposed to be diverted was a mere fraction of that flowing to waste from its gathering ground in this Colony, through comparatively worthless land in Victoria, where it cannot possibly be utilized. To comprehend this question properly, the case of the Snowy River should be compared with that of the Goulburn, Campaspe, and other tributaries of the Murray, to the waters of which New South Wales has as strong a claim as Victoria has to the waters of the upper portions of the Snowy River.

Necessity for intercolonial agreement.

The necessity for an intercolonial agreement is strongly shown by the proposal for the appropriation of the water in the Victorian tributaries of the Murray, without reference to the undoubted rights of New South Wales and South Australia.

Geological features.

The main geological features of the Snowy River basin are the presence of immense masses of granite forming the cores and the summits of the hills, while the slopes consist chiefly of stratified rock of the earliest geological period. The soil, as in all granite districts, is less productive than in places where trap and basalt are abundant, and, owing to the severity of the climate and the mountainous character of the whole basin, the land as a whole is unsuited for agriculture. On the other hand, abundant rains, a moist atmosphere, and the presence of perennial streams, combine to make this part of the country valuable for grazing purposes. It is, therefore, not surprising that considerably over one-third of the land in this basin has been alienated.

Metals.

Gold, copper, tin, and iron have all been found within the drainage area of the Snowy River. The situation of the principal gold-field near the head and along the course of the Eucumbene affords facilities for hydraulic sluicing such as are probably not to be found in any other part of the Colony. The mountain valleys afford favourable sites for storage reservoirs at a great elevation, while the heavy rainfall provides an exceptionally large supply of water to replenish them.

BASIN OF THE BILLABONG CREEK AND EDWARD RIVER.

Although the Billabong Creek and its continuation, the Edward River, carry a much smaller and more uncertain supply of water than either the Murray or the Murrumbidgee, still the lower portions of their channels exist under more stable conditions than either of the last-mentioned rivers.

The Billabong an independent drainage line.

The course of the Lower Billabong is in the bottom of a basin, along the margins of which flow the Murray and the Murrumbidgee; hence these rivers constitute to a great extent the boundaries of the catchment area of the Billabong. It must, however, be understood that the Billabong is an independent main drainage line only in the upper portion of its course, and that after emerging on the plain country it becomes a subsidiary channel for the discharge of flood-water from the Murrumbidgee and also (according to a witness, Q. 2027) from the Murray.

Tuppal Creek. Yanko Creek.

The Tuppal Creek, proceeding from the latter river, and the Yanko Creek from the former, are examples of the channels which assist in relieving excessive floods in the Murray and Murrumbidgee, by discharging part of the flood-water into the Edward River and the Billabong Creek. The latter, as mentioned above, is a true main drainage line throughout the upper part of its course, but the Edward River, into which it flows, is merely one of a

Edward River.

series

series of ana-branches of the Murray, which depend almost entirely on the flood-water of that river for their supply, and which, after uniting, flow again into it at about 15 miles from its junction with the Murrumbidgee.

Fall towards the Billabong.

The direction of flow of the creeks shows that there is a fall in the country towards the Billabong from both the Murray and the Murrumbidgee. Of the total area of this basin, only about 1,300 square miles can be considered as hilly or mountainous, while fully 15,200 square miles consist of immense plains, generally of great fertility, but destitute of any permanent natural supply of water. In the hilly portion of the basin the mean annual rainfall is nearly 25 inches, while in the plains it is only about 14½ inches. In ordinary seasons surface water flows only from the hilly portion of the basin, and the stream thus produced is diminished by evaporation, percolation, and absorption, till it finally disappears altogether. This generally takes place either before the stream leaves the hills or at no great distance from them. The Billabong flows into the Edward only during or immediately after periods of abnormal rainfall.

Area of basin.

Mr. W. C. Bennett's opinion.

Possibility of irrigation.

Levels.

Fall to Jerilderie.

Fall to Colombo Creek.

More than twenty years ago, in his evidence before a Railway Commission at Deniliquin, Mr. W. C. Bennett, Commissioner for Roads and Bridges, gave the opinion that irrigation could be carried out successfully here on an extensive scale. Since then levels and surveys of the Murray and Murrumbidgee and of the Yanko Creek have been made, under the direction of the Engineer-in-Chief for Harbours and Rivers, several lines of levels have been taken by the Railway Department, and levels and surveys have also been carried out by the Deniliquin and Moama Railway Company. These levels have been collected and summarized by direction of the Commission, and the results are highly encouraging, confirming Mr. Bennett's opinion regarding the practicability of canals. In the Engineer's report on the Murray River it is pointed out that, from the place where the Jindera Hills meet that river, about 10 miles below Albury, to Jerilderie, there is a total fall, in that distance, of 119 feet, being equal to a fall of about 18 inches per mile, while from the same point on the Murray to Deniliquin the fall is at the rate of about 21 inches per mile. Again, he reports that the fall from the Murrumbidgee at the gap in the Malebo Range, about 6 miles below Wagga to the point where the Colombo Creek leaves the Yanko—a distance of 56 miles—averages about 2 feet per mile.

Creeks and ana-branches.

In addition to the facilities afforded for the construction of canals by the regularity and favourable slope of the ground, the creeks and ana-branches may in some cases be considered as ready-made inundation canals, which only require to be surveyed and levelled and brought to a fairly uniform slope. The most important instance of this is the Yanko Creek, a project for the improvement of which was inquired into by the Commission.

Lake Urana.

Capacity of lake.

Its flow into the Billabong.

Lake Urana, situated within the drainage area of the Billabong Creek, has already been referred to as an extensive shallow depression. The extreme area of the lake, as shown in the county map prepared by the Survey Department, is about 21¼ square miles. The greatest depth of the lake is stated to be 10 feet (Q. 2035). It is fair to assume from these data that a mean depth of 6 feet might be stored over an area of about 20 square miles. This gives a storage capacity of over 3,345 millions of cubic feet, or nearly 20,909 millions of gallons. If a sufficient supply of water could be added from time to time to balance the loss by evaporation, percolation, and absorption, the quantity of water mentioned above would afford a continuous supply of 53 cubic feet per second for a period of two years. The state of affairs here assumed was in reality closely approached in 1870 and the succeeding years. We have been informed by Mr. S. M'Caughey that the flood of 1870 filled Lake Urana to such an extent that a stream flowed from it to the Billabong for several years afterwards. It must, however, be explained that Lake Urana is fed by the Urana and Coonong Creeks, the former of which draws its supply chiefly from hilly country. So that, on the occasion here mentioned, the water which flowed to the Billabong Creek consisted partly of flood-water which had been stored in the lake, and partly of supplies flowing into the lake from the Urana and Coonong Creeks.

Throughout

Excellence of land for grazing.

Wheat.

Canal from Hay to Deniliquin.

National system.

Throughout the plain country in this basin the land ranks among the best in the Colony for grazing purposes, whether for fattening stock or for the production of a high class of wool. In addition to this, extensive areas are known to be well suited for the cultivation of wheat and other cereals. It is therefore not surprising that in several of the included counties over 75 per cent. of the total area is alienated. The offer made by the owners of land in the vicinity of Yanko Creek to bear half the cost of the work required to improve that creek showed that they were fully alive to the importance of an increased water supply. A similar question has been raised in connection with the Lower Billabong, and a proposal has been made for the construction of a canal from Hay to Deniliquin. Private enterprise has already done much for water conservation and supply in this part of the Colony, by the construction of dams, tanks, and wells; but the field for work on a large scale is so promising, and the results likely to be obtained so important, that we think the survey, design, and construction of the works should be done under a well organized national system.

BASIN OF THE MURRAY.

Source of the Murray.

The Murray has its source in the perennial streams of the Snowy Range, and as in the case of the Snowy River, it flows within this Colony throughout only a portion of its length. From its source to the boundary of South Australia the Murray flows within New South Wales territory, but for purposes of navigation the Colony of Victoria has an equal right to the Murray waters.

Fall of country.

The basin of the Murray is hilly from the source of the river to about Howlong, beyond which place its course is through plain country. Although large alluvial deposits are met with on one or both sides of the river, even before it emerges from the hills, the great alluvial plains, properly so-called, do not commence till Mulwala is passed. Beyond Mulwala the general fall in the district along the New South Wales side of the river is north-westerly, that is, from the Murray towards the Billabong Creek and the Edward River. Thoughout this portion of its course the Murray overflows its banks in high flood, and the water takes the direction mentioned; in other words, the catchment area is here limited to the narrow tract of low-lying land between the bank proper and the river.

Area.

Rainfall.

Mean flow.

Dams on Upper Murray.

Discharge at Albury.

The mountainous or hilly portion of the Murray basin includes an area of about 2,400 square miles. The only meteorological observing station in it is Albury, which has a mean rainfall of 26·17 inches. The country on the Upper Murray is mountainous throughout, the river flows in a deep and generally narrow valley, and the conditions altogether are favourable to the discharge of a high proportion of the rainfall. Under these circumstances, it seems safe to assume that the quantity of surface water which flows off in the Murray from the hilly portion of its basin is equal to a depth of 15 inches over that area. This would give a mean flow for the year of 2,652 cubic feet per second proceeding from the elevated catchment area within this Colony. The discharge of the river is highest in spring, when the water is most required, and Mr. Gipps, who was deputed to report on the possible storage of flood-water on the Upper Murray, believes that much may be done towards this object by the construction of dams. The Engineer to the Commission, in his report on the river Murray, after mentioning that at a time when that river was most unusually low he had found the discharge at Albury to be 1,200 cubic feet per second, suggested the practicability of constructing a canal with a discharge of 1,000 cubic feet per second from the river at the foot of the Jindera Hills, which would be readily obtainable if the storage capacity above referred to were availed of. The importance of such a work can scarcely be over-rated, and the evidences of its practicability are more than sufficient to warrant the cost of the surveys required.

Utilization of flood-waters of the Murray.

As already mentioned in the description of the basin of the Billabong Creek and Edward River, the facilities for utilizing the flood-waters of the Murray throughout the lower portion of that basin are unusually great. It might be supposed that the utilization of those flood-waters is a point which, owing to their abundance, can give rise to no misunderstanding; but this is a mistake. Before the junction of the Murray with the Murrumbidgee is reached, the extent of land in this Colony which can be benefited by the flood-waters of the Murray through inundation canals is little if at all less than 3,500 square miles. On this area it would be quite possible to utilize the whole available supply in an ordinary flood if the means of distribution were provided. The action of the neighbouring Colony of Victoria, in having already arranged for the appropriation of a portion of the flood-water in the Murray, is one more reason for hastening the conclusion of an equitable agreement between the Colonies.

Area of land which might be benefited.

BASIN OF THE MURRUMBIDGEE.

Physical features.

Next to the Murray, the Murrumbidgee is the most important of the western rivers in the quantity and regularity of its discharge. At and near its source its basin adjoins that of the Eucumbene, one of the most important tributaries of the Snowy River. Although in the catchment area of the Murrumbidgee, except near the head of the Tumut River, there are no mountains whose heights approach the peaks of the Snowy Range, still the extent of mountainous country is great, snow is frequent in winter, and the rainfall is in many places exceptionally high.

Area.

The catchment area of the Murrumbidgee, computed from the most recent maps, so far as the junction of that river with the Lachlan, comprises 11,800 square miles of hilly country and 3,600 square miles of plain.

Rainfall.

The mean annual rainfall taken from fifteen stations throughout the former area is 21½ inches, while that in the latter is 14½ inches taken from eight stations.

Strata.

In the higher parts of the basin the strata met with belong to the oldest geological periods, and are frequently broken and intersected by intrusive masses of granite. The soil varies much in quality, but it is as a rule excellent for grazing purposes, while on the high table-land and in the valleys it is highly suitable for agriculture.

Climate.

With a height above the sea varying from 1,000 to 6,000 feet, the climate of the basin of the Upper Murrumbidgee leaves little to be desired. The following comparison of the meteorological features at two places in it—Cooma and Queanbeyan—with those of Dublin, London, Paris, and New York, indicates the temperate character of the climate of this part of New South Wales:—

Foreign comparisons.

Place.	Latitude.	Mean temperature	Mean summer temperature	Mean winter temperature.	Highest reading of thermometer.	Lowest reading of thermometer.	Mean rainfall.	Remarks.
	° ′	°	°	°	°	°		
Cooma.....	36 12 (S)	52·2	64·6	41·6	107·5	15·0	18·4	
Dublin	53 21 (N)	50·0	61·1	40·7	.....	25·0	30·0	
London	51 32 (N)	50·8	62·9	39·5	95·0	5·0	24·0	
Paris	48 50 (N)	51·3	64·7	37·8	104·0	—10·3*	22·9	* 10° below zero.
New York	41 6 (N)	53·2	70·9	30·1	97·0	2·0	46·5	
Queanbeyan	35 20 (S)	53·6	67·2	41·9	109·0	20·0	23·7	

Mildness of the climate.

These figures are from the valuable returns of Mr. H. C. Russell, Government Astronomer, and, as will be seen, they show at a glance the superiority of the climate of Queanbeyan and Cooma over that of Paris and New York. While the mean temperatures for the year are nearly the same, it will be observed that New York is on an average hotter in summer and much colder in winter than Cooma or Queanbeyan. In its mean summer temperature Paris occupies a position between these places; but its mean winter temperature is lower than that of either of them, and its mean range of temperature for the year is greater. The mildness of the climate of the basin of the Upper Murrumbidgee is very striking when its latitude is compared with that of Dublin or London.

Geological formation.

It has been mentioned that granite outbursts are frequently met with, and it may be added that, near or in conjunction with them, dykes or reefs of quartz are often found. Gold is widely distributed in these quartz-reefs, and is found in many places in alluvial deposits, the most important gold-fields in this part of the Colony being those in the neighbourhood of Gundagai, Adelong, and Tumut. Silver and lead have also been found in this basin, and promising deposits of slate have been opened out at Gundagai.

Metals.

Necessity for water conservation.

The necessity for water conservation in this district, both for agricultural and mining purposes, is rapidly becoming more pressing. The practicability of storing flood-water on an extensive scale on the Upper Murrumbidgee and its tributaries has been suggested, and its importance is beyond question; but in only one case, namely, that of the Tantangara Basin, on the Upper Murrumbidgee, has any investigation of even an approximate description been made. In this case, by order of the Commission, a rough survey of the Tantangara Basin was made, and the plan was reported on by the Engineer to the Commission, who pointed out that, according to the information obtained, a dam of 84 feet in height, and of a mean length of 300 feet, would throw back the water to a distance of 6½ miles. This reservoir would contain a sufficient quantity of flood-water to afford a supply of 200 cubic feet per second for 140 days, at a time when the Murrumbidgee is low. We concur in the opinion expressed in that report, that this basin is well worthy of a more complete examination.

Tantangara Basin.

Contents of reservoir.

The Murrumbidgee as a source of canals.

The suitability of the Murrumbidgee as a source for canals has already been referred to in the description of the basin of the Billabong Creek and Edward River, and the practicability of a permanent canal, with its head at or near the place where the Murrumbidgee emerges on the open plains, was suggested. A canal of this description would necessitate the construction of a weir across the river. This weir should, in our opinion, be movable, so that when open there would be no contraction of the waterway, and no obstacle to the passage of flood-water. The remarkably high range of floods in our rivers renders it necessary that, in any works which are carried out for their improvement or for the utilization of their waters, the utmost care should be exercised to avoid raising the flood-level. Under these circumstances it may be laid down as a general rule, that where weirs are to be constructed to raise the surface level in any of our rivers, such weirs should be movable. The importance of works of this description has long been recognized on the Continent of Europe and in India, but till lately it received very little attention in England. In admitting this fact, in a recent address, the President of the Institution of Civil Engineers, Sir F. J. Bramwell, said :—" I think there is good reason to believe that, by the adoption of movable weirs, rivers in ordinary times may be dammed up to retain sufficient water for the mills on their banks, while in time of flood they shall allow channels as efficient for relief as if every weir had been swept away."

Necessity for a weir.

Movable weirs.

Discharge of Murrumbidgee.

Regarded as a source of supply for canals, the Murrumbidgee is inferior to the Murray, in the quantity and regularity of its supply; but it has the advantage of being in New South Wales territory throughout its whole length. When the river was unusually low, in March last, its discharge was found to be 630 cubic feet per second. This discharge, as already suggested, may be materially augmented by the adoption of a system of storage reservoirs in the higher reaches of the Murrumbidgee and its tributaries, and possibly also by the diversion of a supply from the Snowy River. A suggestion has also been made by the Surveyor-General that there is a possibility of supplementing the supply in the Murrumbidgee by the diversion of a portion of the discharge of the Tooma. Even without the prospect of any such increase, the present supply, as well as the favourable nature of the district, warrants the prosecution of a survey for a permanent canal. There is strong evidence that the water flowing in the Murrumbidgee represents only an important portion of the quantity which flows from the higher parts of the catchment area, the remainder passing off by underground percolation. This being so, it is probable that the abstraction of a large proportion of the supply in the river will not affect the discharge lower down to the extent which might be popularly anticipated.

Diversion of portion of the Tooma River.

DRAINAGE AREAS OF THE MIROOL AND OTHER CREEKS.

Between the Murrumbidgee River and the Lachlan is an extensive tract of country consisting chiefly of open plains, but including (chiefly in its upper portion) numerous low ranges of hills. Within this area, which amounts to over 14,000 square miles, are situated the Bullock, the Bland, the Mirool, and several other large creeks, besides many of less importance. These creeks as a rule are dry, except during and immediately after exceptional floods. On such occasions water flows in the creeks to a greater or less distance according to the depth of the rainfall, and in most cases disappears in a swamp or lake. A portion of the water probably passes to feed an underground supply; but, as in the case of the Narran already referred to, evaporation would account for the great part of the loss. Throughout an area of from 2,000 to 3,000 square miles in the extreme eastern portion of this tract of country the mean annual rainfall is 19½ inches, and the mean number of rainy days sixty-seven. These results are obtained from three observing stations, and the mean number of years is seven. In the great portion remaining the mean annual rainfall is under 16½ inches, and the number of rainy days fifty-five, these results being obtained from thirteen stations for a mean period of four and a half years. As the series of basins which constitute the whole tract extend over a length of about 200 miles, it seldom happens that exceptionally heavy rains occur over the whole area simultaneously. In its usual parched condition the ground will readily absorb 3 inches of rain; and as a fall of this quantity in one day is a very rare occurrence, it may, under the circumstances of this district, be inferred that it is not natural to expect any flow whatever in the creeks. Examination of the rainfall in each month makes this point more clear. Within the great portion of this series of basins to the west of the 148th parallel of longitude, the two meteorological stations which show the best average rainfall are Combaning and Bynya, the respective amounts being 18·80 and 18·48 inches. During the year 1884, in only one month did the rainfall exceed 3 inches, namely June, and in that case the total fall, which amounted to 4·54 inches, was spread over a period of twelve days. At Bynya the rainfall during the same month in 1884 was 2·33 inches, and this was the greatest during that year for any one month. In 1883 the rainfall exceeded 3 inches in only one month at each of these places, the month being October, and the respective quantities at Combaning and Bynya 4·17 and 3·24 inches. The fall occurred during seven days at each place.

Area.

Dry creeks.

Disappearance of water underground.

The clearing of the country from scrub and useless timber, and the consolidation of the ground by the trampling of stock, tend to increase the flow of surface water. The result of this will be to increase the supply available for storage in dams and tanks. So far as can be judged at present, such increased storage, together with the development of the use of the underground supply, are the only practicable objects to be aimed at in this district in connection with the conservation and supply of water.

Benefits of clearing scrub.

Trampling of stock.

BASIN OF THE LACHLAN.

The basin of the Upper Lachlan lies between the basins of the Murrumbidgee and the Macquarie, and is separated by the Main Dividing Range from that of the Hawkesbury. The total area of the Lachlan basin is about 13,500 square miles, of which 7,200 square miles consists of hilly country and 6,300 square miles of plain. In the former portion, the mean annual rainfall as reckoned from six observing stations is 20·33 inches, and the mean number of rainy days sixty-six, the mean number of years being five. In the latter the corresponding results, reckoned from ten observing stations, were 13·41 inches of rainfall and forty-one days on which rain was registered. The length of the Lachlan may be taken at 700 miles. It appears from the above figures that the catchment area of the Lachlan is inferior to that of the Murrumbidgee in its extent, and still more inferior in its nature, and that in addition, the rainfall in the basin of the Lachlan is considerably less. As might naturally be inferred, the Lachlan is much smaller in its discharge and more uncertain in its flow than the Murrumbidgee.

Area.

Although

Further survey justified.

Although we have not had an opportunity of obtaining information excepting of a general nature in regard to the Lachlan and its tributaries, the Abercrombie and the Fish Rivers, we have ascertained beyond doubt that much can be done to improve the resources of the Lachlan basin by conserving the flood-waters, and that the prospects of work for this purpose are so assured as to justify a much more extended examination than we have up till the present been able to make.

Lake Cargelligo.

Storage capacity.

Private dam.

Lake Cargelligo is a great natural reservoir of about 10 square miles in area, and with an average depth of about 11 feet when full. (Q. 3279.) This is equivalent to a storage capacity of 2,300 million cubic feet, or 14,375 million gallons. The lake derives its supply from the Lachlan in high floods, being connected with that river by a creek, known as Lake Creek. When the lake has been filled and the river begins to fall, the water tends to flow back to the river. To prevent this, a dam has been constructed by private enterprise in the Lake Creek, but both the nature of the dam and the extent of the storage capacity are capable of much improvement. The plans and sections of Lake Cargelligo referred to in the answer to Q. 3347 will be found in Appendices to the Evidence T 2 and T 3.

THE MANARA COUNTY DRAINAGE AREAS.

Area.

Insignificance of the hills.

Rainfall.

The tract of country bounded by the basins of the Darling, Bogan, and Lachlan, and possessed of no river system, is about 34,000 square miles in extent. Though hills are met with in isolated conical peaks and low ranges, their dimensions are so insignificant when compared with the area of the district, and their effect on the meteorological conditions are so inappreciable that the whole of this drainage area may be classed as plain country. Throughout its whole extent the mean annual rainfall, as reckoned from twenty-nine observing stations, is 12·83 inches, and the mean number of days on which rain is registered is forty-one. The rainfall varies in an important degree in different places. It attains a maximum along the watershed line between the Manara drainage area and the basin of the Upper Bogan, and in particular at the place where these two catchments meet that of the Lachlan. In this neighbourhood the mean annual rainfall is about 20 inches, while in the lower parts of this drainage area, near the district in which the basins of the Lachlan, Lower Murray, and Darling meet, the rainfall does not exceed 11 inches.

Nature of country.

The general description of the land is that it is gently undulating, and abounds in pine and mallee scrub. Frequent patches of low ground are met with where local surface drainage collects, and is lost chiefly by evaporation. Low ridges of schistose rocks or of granite are numerous, and occasionally the granite is found with its surface at the ground level. Besides the great areas covered with dense and worthless scrub, there are immense plains timbered with yarran, belar, and box.

Trial railway survey, Condobolin to Wilcannia.

Levels.

The remarkable absence of well-defined natural features in the Manara drainage area is strikingly illustrated in the section along the trial line surveyed for a railway from Condobolin to Wilcannia. The length of this line is 270 miles. The average elevation of the country traversed in the first 70 miles from Condobolin is 570 feet above the sea, in the next 100 miles 370 feet, and from the end of that length to Wilcannia 270 feet. The difference of level between Condobolin and Wilcannia would give a fall of slightly over 2 feet per mile from the former place to the latter; but in the last 70 miles, ending at Wilcannia, there is practically no fall, the ground being very gently undulating, and having the lower parts of the undulations below flood-level.

Shallow depressions.

Beneficial effect of wells and tanks.

There is no difficulty here in accounting for the disappearance of the rainfall. While the small rainfall and the features of the country are sufficient guarantees that the surface water will not run except on extraordinary occasions, the great dry shallow depressions which are frequently found with creeks leading to them clearly indicate the ultimate destination of the surface-flow. Before the construction of wells and tanks the Manara drainage area was uninhabitable, even by the aborigines; now, through the construction of numerous wells and tanks, an almost permanent supply of water is assured.

So

So far as water conservation and distribution is concerned, the most important feature in this drainage area is its slope towards the Darling. As a natural result of this slope, when high floods are passing down the Lachlan, the flood-water escapes in large quantities in the Booberoy, Willandra, Merrowie, and other creeks, and flows in a westerly direction towards the Darling. It is stated in evidence (Q. 3006) that in a high flood the Willandra Creek carried a supply to within a distance of 30 to 40 miles from Reed's Lake, which is filled by the flood-water from the Darling. It appears, however, that within this intervening space there is a high sand ridge running approximately parallel to the course of the Darling, and that this effectually prevents the flood-water of the one river from mingling with that of the other at this point. No surveys have been made or levels taken of the three creeks mentioned—at least none which would show their capabilities as distributing channels. In the case of the Willandra Creek, however, water flows from the Lachlan to a distance of about 200 miles, and the course of the creek can be traced in a southerly direction beyond even that distance. Considering that the Willandra, though practically in its natural state, has done excellent service as an inundation canal, and that a regular supply so obtained would raise the adjacent land in value to the extent of 400 or 500 per cent., it is sufficiently evident that the improvement of the Willandra and the construction of a weir in the Lachlan to give it a supply in ordinary floods are questions of great practical importance.

Slope towards the Darling.

Willandra Creek.

Reed's Lake.

Sand ridge parallel to the Darling.

Flow from the Lachlan.

Improvement of the Willandra.

The Booberoy and Merrowie Creeks are similar in their nature to the Willandra, but are on a smaller scale; still they must be considered as channels which might be made to play an important part in contributing to the supply of the dry country between the Lower Lachlan and the Lower Darling. It is improbable that the supply which could be made available would be sufficient for irrigation purposes except on a very small scale, but it would afford a plentiful supply to tanks and dams, and the importance of that alone is clearly shown by a witness (Q. 3079), who stated that if wells could be constructed in the Manara drainage area at a cost of £1,000 per well they would be very remunerative. On the whole, the evidence all tends to show that there is an area of at least 10,000 square miles through which the flood-water of the Lachlan can be conducted by gravitation. The part of the country thus situated has a rainfall of only about 11 inches, and the difficulties connected with obtaining supplies from wells are unusually great. In this district then, we find that there is a pressing demand for water, while there are also unusual facilities for, in a great measure, meeting it. The evidence of several witnesses has shown how the Willandra Billabong has already been utilized extensively, and suggests the greatly increased value it would have if dealt with systematically as a whole. In regard to the Merrowie Creek, it has been stated that flood-water has been conveyed a distance of 50 or 60 miles along that channel (Q. 2885). That it is not only desirable but practicable to divert the flood-water from the Lachlan along a series of dry creeks into the district here included under the Manara drainage area is confidently asserted (Q. 2867 and 2868).

Booberoy and Merrowie Creeks.

Value of wells.

Area to be benefited by irrigation.

Practicability of scheme for diversion of Lachlan.

BASIN OF THE DARLING.

On account of the immense extent of its basin, the fertility of the districts through which it flows, and the great highway it affords for commerce, the river Darling, notwithstanding the comparative insignificance of its average discharge, is in some respects the most important river in New South Wales. The portion of the catchment area of the Darling lying within the Colony of Queensland is 103,650 square miles in extent, but of this only 15,000 square miles belong to that part of the river above Walgett. In New South Wales the area of the basin, as far as the junction with the Namoi at Walgett, is nearly 20,000 square miles. The total drainage area as far as Walgett, and not including that of the Namoi, may therefore be taken as 35,000 square miles. Bearing in mind that below Walgett the river flows a distance of 2,345 miles before it reaches the ocean, its importance can be better appreciated when it is considered that the above-mentioned catchment area at Walgett is nearly seven times the entire basin of the Thames. As the ordinary discharge at Walgett is a mere fraction of even that of the Thames, it is not surprising that

Importance of the river.

Area.

Whatbecomes of the rainfall?

that the question, "What becomes of the rainfall?" has given rise to much discussion. This question presents little difficulty when the nature of the catchment area, and the amount of rain and the time and manner in which it falls, are taken into account. In treating of other basins, it has already been pointed out that in the west of this Colony not only does the plain country contribute almost nothing to the rivers, but that evaporation and the growth of vegetation are sufficient to account for almost the entire rainfall. While rain is actually falling, the basin of the Darling may be considered as consisting of two classes of country—the contributing and the non-contributing area. In dry periods the river depends almost entirely on percolation from the hilly parts of its basin. At such times the basin may be divided under two principal heads, which may be termed respectively the contributing area and the reducing area. As rain seldom falls simultaneously over the entire extent of the Upper Darling basin, and as evaporation is continuous, there is at all times a greater or less extent of reducing area. It may therefore be broadly stated that the basin consists of contributing, non-contributing, and reducing areas, which are all constantly varying in extent. The hilly portion of the basin represents, except in extraordinary floods, the maximum extent of the first-mentioned area.

The contributing area of the Darling and the non-contributing.

Catchment area at Walgett.

It has been mentioned that the catchment area of the Darling or Barwon at Walgett is about 35,000 square miles, of which 15,000 square miles are situated in Queensland. Of the latter area, approximately 8,000 square miles may be classed as plain country, and therefore non-contributing, leaving in Queensland an effective catchment area of 7,000 square miles. The catchment area in this Colony above Walgett may be taken as comprising 10,400 square miles of hilly and 9,300 square miles of plain country. The proportion of the basin from which surface water can, under favourable circumstances, be expected to reach the Darling is thus reduced to 17,400 square miles. Even of this diminished area a large proportion is intermittent and irregular in the supply it yields. Add to this that the mean temperature in the shade throughout this part of the country is probably not less than 70°, that hot winds are of frequent occurrence, and that the drainage from the contributing area has to flow in a tortuous course and with a very low velocity through the non-contributing area. All these points have an important effect in preventing surface water from reaching the river, and in diminishing the volume of water flowing in the river. There is, in addition, another point of the highest importance in its influence on the discharge of surface drainage; namely, the manner and the season in which the rainfall occurs. Taking Myall Creek as an instance by which to judge the contributing area, we find that in 1884 the rainfall was only 20 inches, and that in not one month did the quantity registered reach 3 inches. The number of rainy days was seventy-four. It is sufficiently evident from these figures that the neighbourhood of Myall Creek cannot during 1884 have contributed more than a merely nominal proportion of the rainfall to the supply of the river. In 1883 the rainfall at the same station amounted to 26·89 inches, of which 14·58 inches fell on thirty-six days during the months of November, December, January, and February. The quantity exceeded 2 inches per month only during five months, and the highest falls were in January and February, the hottest months of the year—the period when the loss by evaporation and absorption would be the greatest. As the streams which feed the Upper Darling are numerous, and many of them flow long distances through plain country before they reach that river, the loss of water from the causes above mentioned must be exceptionally high. In the case of a river 1,000 miles in length, and with a mean width at the water of 100 feet, a loss of one quarter of an inch per day from evaporation would be equal to a constant discharge of nearly 130 cubic feet per second. The tributaries of the Darling and that river itself as far as Walgett would have a much greater surface than such a river as that supposed. Bearing in mind that a river loses by evaporation not only from the water surface, but also from the surface of the banks, which are more or less saturated by capillary attraction, the loss here mentioned must be considerably within the actual amount. Again, in the case of rivers such as the Darling, flowing in alluvial soil, a loss of half a cubic foot per second per mile by absorption would be by no means remarkable.

Temperature.

Causes of rainfall not reaching the river.

Rainfall.

Losses through evaporation.

Rate of absorption.

From the foregoing considerations, it is evident that the quantity of water which passes to underground currents cannot be nearly so great as is sometimes supposed. There can be little doubt that little or no surface water passes off to feed the underground supplies, excepting from the mountainous portions of the basin. The line along which the greatest loss by underground percolation is likely to occur is at the place where the granite and the silurian strata end and the great alluvial plains begin. The data at present available are not sufficient to enable an accurate estimate to be formed of the proportion of the rainfall thus disposed of. In any case it would be a difficult point to determine. In the hilly portion of a catchment area the surface water reaches the main stream through many small channels, but, in addition, the crevices in the rock and the interstices in the ground become innumerable passages through which the water percolates by gravitation till it reaches the river at a lower elevation among the hills, or else passes on to feed underground supplies in the plains. The fact that at least 3 inches of rainfall is required as a rule to saturate the plains sufficiently for one irrigation, and that such saturation is a rare occurrence, precludes the idea that any portion of the rainfall in the plains is, under ordinary circumstances, lost by percolation. As an apparent exception to this rule, when the supply in the Darling is low, there is percolation into it throughout a great portion of the length between Walgett and Bourke. On the other hand, when the river is high, there can be no doubt that there is percolation from the river for a short distance from its banks; so that it is not improbable that the subsoil, which becomes saturated from the river in times of flood, yields the water of saturation again when the river is low. Under the circumstances, this explanation, so far as that part of the river is concerned, seems more likely than that the percolation comes from a great distance.

Quantity of water reaching underground supplies insignificant.

Percolation into the river.

Below Walgett, the principal tributaries of the Darling are the Castlereagh, the Macquarie, the Narran, the Bokhara, the Culgoa, the Bogan, the Warrego, and the Paroo. These rivers are all intermittent. The only well-authenticated instance in which the Paroo flowed into the Darling occurred in January last, and this was due to a fall of rain which was altogether unprecedented in that neighbourhood. Near Wilcannia, 9 inches to 10 inches of rain fell within three days; and, in some parts of the basin of the Paroo the fall in the same time was as much as 12 inches. Within this Colony the area of the basin of the Paroo is over 15,700 square miles, while in Queensland there is a further area of 13,400 square miles. As heavy rain fell throughout the greater part of this immense area, the fact that the flood in the Paroo rose to an unprecedented height is not surprising. When it is considered that the mean annual rainfall throughout the basin of the Paroo is only 10·77 inches and the mean number of rainy days thirty-two, and that the basin consists chiefly of plain country, it is but natural that in ordinary seasons the Paroo is a river only in name.

Tributaries of the Darling below Walgett.

Flow from Paroo into Darling.

Area of Paroo basin.

Rainfall.

The Narran has already been referred to under the head of "Evaporation" (p. 15.) Between that river and the Darling or Barwon there is a large creek known as "The Big Warrambool," which is in reality a "river" of the same class as the Narran, although of less importance, and with a catchment area of more than 3,100 square miles, in this Colony alone. It is in fact more deserving of the name than is the Narran, for the latter, and also the Bokhara, Birce, and Culgoa, are only branches into which the Balonne River divides. All these are of the same type, that is to say, water flows in them to the Darling only in times of flood, or in exceptionally rainy seasons.

The Narran.

The Big Warrambool. Its area.

The drainage area of the Darling as far as Walgett has been considered separately, because the most reliable portion of the contributing area lies above that place. The total drainage area of the Darling at its junction with the Murray, including the basins of its intermittent tributaries, is 231,000 square miles. At Wilcannia the area is 201,600 square miles, and at Bourke, 148,000 square miles.

Drainage area of the Darling.

The mean annual rainfall, as calculated from forty-six stations in the plain or non-contributing portion of the drainage area of the Darling proper, is 12·81 inches, and the mean number of rainy days, thirty-five. The corresponding figures in connection with some of the tributaries show better results. On the Upper Bogan the rainfall

Mean rainfall.

rainfall is 18¼ inches, and on the Lower Bogan 14⅓ inches, and the corresponding figures for the Upper and Lower Castlereagh are 19 and 17⅓ inches respectively. The most favourable rainfall returns for any portion of the Darling basin are those for the mountainous country at and near the sources of the M'Intyre, in the mountains of New England. There the average annual rainfall as reckoned from eleven observing stations is 28·17 inches, and the average number of days in the year on which rain is registered, 76.

Non-contributing area.

Of the total area of the basin as far as Bourke, at least 100,000 square miles must be classed as non-contributing. The mean distance of Bourke from the contributing area cannot be less than 450 miles; the fall in the intervening country is very slight and the velocity in the river correspondingly low, and the river banks consist of alluvial deposits, covered with an abundant growth of varieties of eucalyptus trees, which appear to absorb more moisture from the ground than those of almost any other species. Under these circumstances, it is obvious that the loss of water from the river must necessarily bear an exceptionally high ratio to the discharge. Also while the maximum contributing area above Bourke is about 48,000 square miles, it is evident that, judging from the high temperature and the low rate of monthly rainfall, as well as from the unfavourable nature of much of the basin, the actual contributing area is generally only a small proportion of that mentioned. The information obtained by actual gauging is altogether insufficient to lead to a conclusion as to the actual proportion of the rainfall which flows off in the river. In January last

Discharge of river at Bourke.

the discharge at Bourke was found by our Engineer to be only 376 cubic feet per second; and in May last, when the river was considerably lower, he found the dis-

Discharge at Walgett.

charge at Walgett to be scarcely 15 cubic feet per second. When the latter gauging was taken the discharge at Brewarrina and Bourke was higher than at Walgett. This was attributed partly to the percolation into the river, and partly to the interception of the underground flow by the bar at Brewarrina.

Proportion of rainfall discharged.

While no exact conclusion can be arrived at regarding the proportion of the rainfall discharged, there is sufficient information to account for the fact that this proportion is very low. Australia is not by any means the only country in which rivers beyond certain points in their courses gradually diminish in volume till they finally disappear, but it is probable that the instances of this feature which are found in this country are more striking and on a more extensive scale than are found elsewhere.

Permanent canals impracticable.

From the foregoing description of the Darling, it is evident that the discharge is too small and too uncertain to provide for permanent irrigation canals under present conditions. On the other hand, the immense volume which passes down in floods

Utilization of flood waters.

might in many places be utilized with advantage and at a moderate cost. This could be best done in the majority of cases by diverting the water into lakes, lagoons, anabranches, and other great natural depressions, and storing it there for the use of stock or for irrigation. There are, however, cases in which the water could be used for flooding the land, and thereby greatly increasing the yield of grass. That this system can be carried out with excellent results has been practically demonstrated on the Lower Lachlan, and there is no reason why it should not be successful on an extensive

Weirs.

scale on the Darling. To facilitate the utilization of the flood-waters, weirs should

Value of the rocky bars as weir sites.

be erected in suitable places, and for this purpose the rocky bars which cross the bed of the river in many places will afford favourable sites. The erection of weirs, besides aiding in the diversion of a supply from the river, will maintain the water at a high level in times of drought, and will thereby greatly add to the facilities for obtaining supplies by pumping for irrigation and for the use of stock. Great encouragement

Absence of silt at the Brewarrina Falls.

to the construction of weirs is furnished by the fact that no silting up of the river has occurred on the upstream side of the Falls near Brewarrina, but that on the contrary deep water extends to a distance of several miles. Our Engineer reports that, with a low supply in the river, the difference in level between the water above and that below the Falls was 10 feet 9 inches. At that time the depth of water near the centre of the river to a distance of 6 miles above this barrier was in all places over 10 feet, and was stated to be as much as 30 feet in some places near Brewarrina.

Prospects of irrigation.

The work already done in the Darling basin towards water conservation clearly shows, first, that the land is eminently suited for irrigation; second, that irrigation

irrigation is remunerative; and third, that legislation which will define and secure the national right in the water supply, and will at the same time encourage local and private enterprise, is urgently called for. On the Gwydir and other tributaries of the Darling, as well as on that river itself, pumping machinery, in some instances of a very powerful description, has been erected and brought into use. While enterprise of this character deserves to be commended and encouraged, grave misunderstandings are certain to arise if legislation of the nature referred to above is not soon provided. The pressing importance of this point is made clear by the fact that the pumping machinery on the Gwydir for filling natural channels for stock purposes, here referred to, is capable of raising a supply of water far in excess of the entire discharge which was gauged in the Darling at Walgett, in May last.

Pumping on the Gwydir.

Legislation necessary.

So far as the evidence obtained enables us to state, the most favourable places, in addition to the bed of the Darling itself, for intercepting water during high floods and storing it for future use, are to be found in the Culgoa and other tributaries of the Darling, in the Cato and Tarrion Creeks, and in the lakes and other great natural depressions which are found at intervals on both sides of the river from Wilcannia to its junction with the Murray. On the whole, the natural facilities afforded for the storage of flood-water are very extensive, and the future development of the Darling basin will depend on the extent to which these facilities are employed.

Culgoa River.

Cato Creek.

Tarrion Creek.

BASINS OF THE BOGAN, MACQUARIE, AND CASTLEREAGH.

With its sources on the western slopes and among the high table-lands of the Dividing Range, and having in its catchment area a large proportion of hilly country, the Macquarie would naturally be expected to rank among the most important tributaries of the Darling. The area of the basin of the Macquarie is about 15,440 square miles, of which 9,830 square miles may be classed as hilly, and 5,610 square miles as plain. The mean annual rainfall, calculated from eleven observing stations in the hilly portion of the basin, is 23·17 inches, and the mean number of rainy days sixty-six; in the plain portion of the basin, the mean annual rainfall as calculated from three observing stations is 15·67 inches, and the mean number of rainy days forty-six. The length of the Macquarie is estimated at 750 miles. In the upper parts of its basin, gravel ridges, deep deposits of disintegrated granite, and extensive areas of permeable soil are met with; these conditions, together with the comparatively low monthly rainfall, limit the proportion of the surface water which reaches the river. The fall of the river here is considerable, so that the water which reaches it flows off freely. As the river reaches the plains and passes in a tortuous course towards the Darling the rate of fall diminishes, and the channel decreases in size till it reaches the Macquarie Marshes, where it divides into a number of creeks; with a low discharge in the upper parts of the river the water disappears before it reaches these Marshes. In ordinary floods the diminished section of the channel obstructs the passage of the flood-water and forces a potrion of it over the left or lower bank; the remainder of the flood-water passes on to the Marshes, where it spreads out in a thin sheet over immense reed-beds, and is there retained till it disappears by evaporation and absorption. In extraordinary floods only does the Macquarie water reach the Darling; on such occasions the floods escape over the left bank of the Macquarie in many places, the first being at Narromine, and flow in a series of creeks to the Bogan and thence to the Darling. In addition, the Marra Creek carries a portion of the discharge from the Macquarie to the Darling direct.

Area of the Macquarie basin.

Rainfall.

Nature of country.

Macquarie Marshes.

Flow from the Macquarie to the Darling.

Marra Creek.

From the place where it leaves the hills, the course of the Macquarie lies almost entirely through alluvial deposits. In the hilly country the valley occasionally opens out into rich alluvial flats bounded by rocky ridges, through which the river seems to have cut a passage. Mr. James Samuels, jun., of Dubbo, in an interesting paper communicated to us, suggests that there was at one time a series of lakes along the course of the Macquarie between Wellington and Narromine, and that these became filled up with gravel and shingle. The presence of very

Geological formation..

very deep deposits of this description at intervals throughout the portion of the river here mentioned gives considerable weight to this theory.

Discharge of the Macquarie.

The discharge of the Macquarie was gauged by our Engineer in February last, and again in April. On the first occasion it was found that, while the discharge at Dubbo was 114½ cubic feet per second, that at Warren was only 52 cubic feet per second; and it was shown that, of the proportion lost, not more than 16½ per cent. could be accounted for by evaporation. On the second occasion the discharge at Dubbo was only 20 cubic feet per second, while at 18 miles up stream from Warren the flow entirely ceased. Owing to altered conditions, evaporation would in this case account for 38 per cent. of the loss, leaving the remaining 62 per cent. to be accounted for by absorption and percolation. The latter division of the loss in February was equivalent to about two-thirds of an inch per day over the wetted surface, or to half a cubic foot per second for every mile of the river. In the case of the smaller discharge, the loss due to percolation and absorption was about equal to a quarter of an inch per day over the wetted surface. These rates of loss by absorption and percolation are by no means remarkable or exceptional. In Mr. Russell's Rainfall Report for 1882, it is mentioned that experiments made in connection with European forests have shown that a moderate-sized tree will absorb from the ground 16 gallons of water per day. The eucalypti absorb an exceptionally large quantity of moisture, so that it would probably be safe to assume that an average tree on the banks of the Macquarie absorbs 18¾ gallons or 3 cubic feet per day. On this hypothesis, and taking the number of trees at 2,000 per mile of river, the quantity of water required for these trees alone on a length of 180 miles would be equal to a constant flow of nearly 12½ cubic feet per second. When the discharge at Dubbo was about 20 cubic feet per second, the loss by evaporation between that place and the point at which the flow ceased was about 7½ cubic feet per second. It appears therefore that the requirements of 2,000 trees per mile of river would have accounted for the entire loss by absorption. It is not intended to be conveyed that this is the precise manner in which the entire loss was accounted for. These points are brought forward to show that, as already stated, there is nothing abnormal in the proportion of loss from the Macquarie.

Absorption by trees.

Percolation in the hills.

Mr. Samuels has observed that a flood in the higher reaches of the Macquarie has only a slight effect at Dubbo, and that a high flood at the latter place generally occurs when the upper parts of the basin have been saturated by a preceding flood. This fact, together with the very large supply obtainable from wells at and near Dubbo, shows the extensive scale on which percolation takes place in the hilly part of the basin.

The Castlereagh and the Bogan.

In high floods the waters of the Lower Castlereagh unite with those of the Lower Macquarie; and at the same periods, the floods in the Macquarie are relieved by various outflows to the Bogan, chiefly from places between Narromine and Warren. On this account, to obtain a comprehensive view of the question of water conservation in this part of the country, it is necessary to consider the basins of the Castlereagh and the Bogan in conjunction with that of the Macquarie.

Area of Castlereagh basin.

Rainfall.

The area of the basin of the Castlereagh is about 6,750 square miles, of which 3,890 may be classed as plain, and 2,860 as hilly. The mean annual rainfall in the plain, as reckoned from ten observing stations, is 17·43 inches, and the mean number of rainy days forty-three. In the hilly portion of the basin the mean annual rainfall at two stations is 19·10 inches, and the mean number of days on which rain falls fifty-two. The basin of the Castlereagh does not extend to the Dividing Range. The hills amongst which that river and its tributaries have their sources are of very moderate height, and exercise comparatively little influence on the flow of surface-water; and the course of the river, which has a length of about 300 miles, lies chiefly through arid plain country. These conditions, together with the scanty and irregular rainfall, combine to constitute the Castlereagh an inefficient escape channel for wide-spreading floods, while its normal condition is that of a dry receptacle for drifting sand.

Almost

Almost midway between the Lower Macquarie and the Castlereagh, and at the junction of the counties of Clyde and Gregory with the county of Leichhardt, there is a remarkable sand ridge, commonly known as "The Monkey." Good water, but in limited quantities, is found everywhere in this sand ridge, at depths generally varying from 15 to 25 feet from the surface. The source from which the supply in this ridge is obtained, and the possibility of augmenting or conserving it by sub-soil dams or otherwise, are questions well worthy of further consideration. "The Monkey" sand ridge.

The catchment area of the Bogan, like that of the Castlereagh, is unsatisfactory so far as its capability of delivering surface water is concerned. Of a total area of about 13,150 square miles, 9,750 is plain country and only 3,400 square miles hilly. The mean annual rainfall reckoned from eight stations in the former area is 14·51 inches, and the mean of two stations in the latter is 18·23 inches. The corresponding numbers of rainy days are 40 and 50. The length of the Bogan is 450 miles. These conditions show that the description already given of the Castlereagh applies in almost every particular to the Bogan; but the latter, owing to the greater area of the hilly portion of its basin, runs more frequently than the former. Area of Bogan basin. Rainfall.

In the description of the general configuration of the country it has been mentioned that, while the Castlereagh, Macquarie, and Bogan flow in a northerly direction, there is also a fall almost at right angles with these rivers in a westerly direction. The consequence of this is that in floods the Castlereagh overflows into the Merri Merri Creek, and the flood-water unites with that of the Macquarie. The latter river also overflows in many places, and flood-water from it passes to the Bogan in the Beleringa, Duck, Gunningbar and other creeks. Nature has therefore already demonstrated that the flood-water from the Castlereagh can be distributed through an extensive tract of country lying between that river and the Macquarie, and also that the flood-water of the latter river can not only be distributed throughout a great portion of the district between the Macquarie and the Bogan, but can also be used to supplement the supply in the latter river. Already private enterprise has done valuable work for the conservation of flood-water in this part of the Colony, particularly on the Bogan and on the creeks leading towards it. As an instance the Muddall dam on the Bogan may be referred to which holds back a permanent supply of water to a distance of 10 miles. It is, however, evident from the circumstances of the case that the lower portions of these three rivers—the Castlereagh, the Macquarie, and the Bogan—together with the intervening creeks, might be advantageously considered and dealt with conjointly. Works carried out by private enterprise are naturally intended only for the use and convenience of the persons at whose cost they are constructed, but all such works should be in harmony with a comprehensive system under which the available supply of water should be made to benefit the greatest possible area. Fall of country. Various creeks. Muddall dam. Necessity for a national system.

BASIN OF THE NAMOI AND PEEL.

In the length of its course and the extent of its catchment area the Namoi is one of the most important of the tributaries of the Darling. The basin of the Namoi has an area of about 16,250 square miles, of which 11,800 square miles is plain country and 4,450 square miles hilly. The mean annual rainfall in the former portion, as reckoned from eight observing stations, is 19·20 inches, and the number of days on which rain is registered fifty-five. In the hilly part of the drainage area the mean annual rainfall, as obtained from seventeen observing stations, is 22·37 inches, and the mean number of rainy days fifty-eight. The mean temperature of the basin may be taken at 63° or 64°. Area of Namoi basin. Rainfall.

The contributing portion of the catchment area of the Namoi is small compared with the whole area of the basin, and on this river is irregular in its flow, and frequently ceases to run for months together. The methods which suggest themselves as remedies for these disadvantages are, first, to construct a series of weirs in the river, and second, to store the flood-water in the higher parts Necessity for weirs.

of

of the basin and allow it to escape by degrees when the river is low. So far as we have been able to ascertain, both these methods of conserving and utilizing the available supply can be adopted. On the subject of weirs, a witness who has given much attention to the question of water supply in the Namoi basin has informed us (Q. 1756) that in his opinion weirs could not be adopted on the Namoi below Narrabri, on account of the friable nature of the soil; but he also states that above Narrabri there are good sites for weirs in the river, and that there are also places suited for storage reservoirs both in the Namoi and its tributaries. The evidence regarding probable sites for storage reservoirs was so definite and encouraging that in order to obtain further information on the subject we deputed Mr. Gipps to inspect and report on these sites. The result of this examination was to convince him that at a place on the Namoi, about 7 miles above its junction with the Peel, a dam 75 feet in height would hold the water back to a distance of 13½ miles, and would secure the storage of 10,000 million gallons of water. The foundation and flanks of this dam would be in rock, and its length at the top and base respectively would be only 812 feet and 115 feet. Other favourable sites were found, and on the whole the investigations made were sufficient to warrant a further examination of the Namoi and its tributaries.

Weirs impossible below Narrabri.

Mr. Gipps' survey.

Site for dam.

Capacity of reservoir.

Source of underground water.

The information which we have elicited tends to show that, as a rule, the source from which underground supplies of water are derived is in the hilly portions of the river basins. In the case of the basin of the Namoi and Peel the reasons in favour of this conclusion are exceptionally strong. In the higher parts of this catchment area, springs yielding remarkably large supplies of water are found. Some of these springs have already been referred to, under the heading of "Wells" (p. 29), and need not be further described here. Going towards the west the underground supply becomes smaller and more precarious, and salt water is more frequently met with. The most reasonable explanation of this is that the rain falling on the tertiary and other more or less permeable strata among the hills percolates into them and passes under the plains, spreading over a wider area as it flows westward. Under this hypothesis, the strong springs near the hills would be accounted for by the underground flow being confined within narrow spaces, while being at the same time under the direct influence of a considerable "head." In the plains, as the underground water spreads over a wide area its rate of flow becomes diminished, the quantity available at any one place is more restricted, and with the approach to stagnancy the proportion of salts in solution increases. While this may be taken as a general rule, exceptions and modifications caused by irregularities in the underground strata are frequent. The improbability of the occurrence of percolation, except on a very small scale, in the plain country, has been discussed in connection with other river basins—particularly that of the Darling—and the reasons there given apply with almost equal force to the basin of the Namoi.

Insignificance of percolation.

Fertility of the district.

This basin includes extensive tracts of land which are unsurpassed in fertility in any portion of the Colony west of the Dividing Range. Its remarkable productiveness when irrigated has been practically demonstrated in several instances, while, on the other hand, the liability of the plains of the Namoi to be devastated by droughts, and the uncertainty of obtaining crops of any kind, even in fairly good seasons, show that water conservation is an absolute necessity. To provide this we require, first of all, legislation to direct and foster private and local enterprise, to protect individual and public rights, and to provide means for initiating and carrying out such works as are beyond the capabilities of local effort.

Water conservation imperative.

Legal protection.

YANTARA DRAINAGE AREAS.

Absence of a river system.

The entire portion of the Colony lying to the west of the basin of the Paroo is destitute of any large river system. It comprises a number of separate and independent drainage areas, but these are included here under one designation, and are considered together for the sake of convenience. The united area of these catchment basins is about 22,100 square miles. The mean rainfall reckoned from twelve observing stations is 8·56 inches, and this being obtained from an average period of six years, may

Area of catchment basins.

may be relied on as a close approximation to the average fall over the whole area. The mean number of days during which rain is registered in the course of a year is 26. Rainfall.

As in the Manara drainage area, low ranges of hills are common in the north-western district, but here also the hills are of little effect either on the quantity of the rainfall or in influencing the flow of surface water. The Kooningberry and the Mount Brown Ranges are two of the most important, and the heights of these above the surrounding plains were found by Mr. H. Y. L. Brown, Geological Surveyor, to be only 700 and 400 feet respectively. Still there is a fairly defined watershed line extending south from the Queensland frontier, and maintaining generally a distance of 40 to 50 miles from the boundary of South Australia. This watershed line passes into South Australia, near Silverton. Thence in the tract of country north of Silverton and west of the watershed described the course of surface drainage is towards South Australia. Kooningberry Range. Mount Brown Range. Watershed line.

There is in Queensland an extensive and important natural drainage line, which is finally lost in the Yantara Drainage Area. This is the Bulloo River, which in times of flood empties itself into a large clay-pan or swamp which has a length of from 40 to 50 miles, a breadth of about 12 miles, and a depth of 12 to 15 feet (Q. 3024). The extreme dimensions here given would be equivalent to an area of 600 square miles; but, assuming that the area is 200 square miles, a river with a discharge of 1,344 cubic feet per second would be required to replenish the loss by evaporation alone, taking the rate of this loss at a quarter of an inch in twenty-four hours. It is, under these circumstances, quite natural both that the water should disappear rapidly and also that, with such extensive evaporation, salts should be deposited in the soil constituting the bed of the swamp. Again, taking the area of the swamp as above at 200 square miles, and its mean depth throughout that area as 10 feet, the quantity of water required to fill the swamp, and allowing for evaporation, would be equal to a flow of more than 8,000 cubic feet per second for 100 days. The practicability of utilizing the water of the Bulloo by cutting a channel from this swamp to the Yantara Lake has been suggested by a witness who has had extensive experience in this part of the country (Q. 3024). Bulloo River. Area of swamp. Channel to Yantara Lake.

The Yantara, Cobham, and Salt Lakes are the receptacles for the surface drainage of an extensive area. The available information regarding these lakes is meagre; but the first has been favourably mentioned as a place in which flood water can be stored, and from which it can be distributed. In a published report to the Commissioner for Roads by one of his officers, Cobham Lake is described as being at the time of report "a grand sheet of fresh water;" but details regarding its dimensions are not supplied. The Yantara and Cobham Lakes are fed by several intermittent creeks, but the supply is irregular and precarious, so that if it can be supplemented from the Bulloo, a good permanent store of water in these lakes will be available. Yantara, Cobham, and Salt Lakes.

The scanty and uncertain rainfall, the value of the gold and other mineral deposits, and the general absence of permanent natural supplies of water, render the construction of tanks or reservoirs for water conservation of the utmost importance for the development of this part of the Colony. To make these works permanent, it is necessary to provide in them for a depth of at least from 18 to 20 feet of water. From his experience of such works, the Commissioner for Roads and Bridges has adopted a standard depth of 18 feet, and a capacity of from 12,000 to 20,000 cubic yards—that is, 2,000,000 to 3,400,000 gallons, exclusive of any conservation above the ground level. Necessity for water conservation in this district. Standard depth of Government tanks.

TARA COUNTY DRAINAGE AREA.

In the south-west corner of New South Wales there is an area of over 6,000 square miles of plain country which contributes practically nothing to either the Darling or the Murray, and which on this account is here classed as the Tara Drainage Area. The range of hills which has been referred to as crossing from Wilcannia into South Australia forms the northern boundary of this tract of country. Very few Area.

Rainfall.

few rainfall returns are received from it, but from those published by the Government Astronomer it would appear that the mean annual rainfall is about 9 inches. The information which we have up till the present been able to obtain regarding this part of the Colony is insufficient to enable us to form an opinion regarding it.

LAKE GEORGE BASIN.

Area.

The basin of Lake George includes an area of nearly 490 square miles. The lake itself is at an elevation of about 2,200 feet above the sea-level, and may be regarded as a shallow depression in the table-land near the summit of the Dividing Range. The mean annual rainfall at Gundaroo, which is in the vicinity of the lake, is 22 inches. The question of evaporation and of the nature of the water has already been referred to at length, in an extract from a communication received from the Government Astronomer. The information available shows that before Lake George can hold an important place in connection with any large scheme for water conservation and supply two points require to be established—first, that it is practicable to conduct a supply by gravitation into the lake from one or more streams situated outside its basin; and, secondly, that it is practicable to tap the lake in order to distribute the supply so obtained. To prove that such works can be done plans and a report were submitted by Mr. Gipps, and from examination of these we concluded that a further survey is desirable to place the matter beyond question.

Rainfall.

Evaporation.

Necessity for further survey.

(11.) RIPARIAN RIGHTS AND PROPOSED LEGISLATION.

Reservations for water supply.

In the administration of the public estate Governments have had some regard to the future requirements of the Colony by reserving land from sale for the purposes of water supply. The Surveyor-General has instructed his staff that in the subdivision of land for sale the surveyor should in view of future settlement exercise judgment in selecting, and recommending for reservation for public use permanent waterholes, springs, and parts of rivers desirable for water supply, which in this arid climate might be beneficial for the occupation of surrounding country; and to the extent to which the survey staff have exercised intelligently the important discretion vested in them, facilities have been provided for the conservation of water. Although many valuable reservations have been made, it is greatly to be feared that the public interests have not always been sufficiently protected. In view of the different degrees of importance which so large a number of officers might be expected to attach to an instruction of this kind, and to the circumstances under which the alienation of the public lands have taken place, it would be strange if some errors were not committed; and perhaps on the whole there is reason for gratulation that even so much prudence and forethought have been exercised. The Surveyor-General, recognizing that certain indefinite riparian rights would be conferred by the alienation of Crown Lands with frontage to lagoons, swamps, and lakes, has embodied in the regulations for the guidance of licensed surveyors, a direction that the contour of such swamps and lakes should not be treated as a boundary, but that the land to be alienated should be defined by right lines, and the instruction is apparently designed to avoid giving a right to their beds as far as possible without direct legislation. Throughout the Colony, more particularly along the navigable streams of the Murray and Murrumbidgee, a large quantity of land has been sold of which the rivers form part of the boundaries, and thus riparian rights, whatever they may be worth, have been alienated. In the administration of the law, so far, dams have always been recognized by the Government as improvements, in virtue of which special concessions have been made to the pastoral lessee. This departmental encouragement, however, to private individuals to conserve water has no legal validity as against the rights of other owners whose land has frontage to the watercourse. Many such dams have been cut away in reliance upon the riparian doctrine which entitles all who have frontage to a stream

to the undiminished flow of its waters, subject only to the limitation of reasonable use. The sense of insecurity which prevails in regard to the legality of dams has operated very powerfully to discourage the construction of such works, although in many localities they form the best means available of storing surface water. The antagonism which has been shown to the erection of dams has doubtless been intensified by the absence of any regulation as to their height and other details of construction, and there has been an impression, in many cases well founded, that the dams which have been constructed have been designed so as to divert the water from its natural channel, thereby causing a waste over the plains.

We are of opinion that the doctrine of riparian rights which obtains under the common law of England is not applicable to the conditions of Australia, and that it is calculated to be a very serious obstacle to the progress of this Colony, in so far as that progress depends upon the conservation of water. In Victoria no such rights can accrue, because the frontages to all rivers are reserved from sale; but, inasmuch as a different policy has been pursued here, and alienations have taken place which involve the legal right of ownership to the middle of the bed of a stream, it seemed desirable that we should obtain a clear definition of what riparian rights are. In addition to valuable suggestions on the subject of riparian rights, we have been favoured with the following memorandum on the subject from Mr. Alex. Oliver, M.A., Parliamentary Draftsman:—

English law inapplicable to Australia.

Memorandum by Mr. Alex. Oliver.

Riparian rights as existing by the Common Law of England, are rights which are annexed to the ownership of land through or past which a river runs; and derivatively to all persons having a right of access to such a river.

Riparian rights do not attach quoad the bed or alveus, but only quoad the bank of a river.

Two kinds of rivers are known to the Common Law: 1. Public navigable rivers in which the tide ebbs and flows, and of which the ownership of the bed is *prima facie* in the Crown. 2. Private rivers or streams beyond the ebb and flow of the tide, which by use or statute have in many cases become subject to public rights of navigation, fishing, &c.

If such a river runs through the land of a private individual he is at common law *prima facie* the owner of that river's bed; if it separates the properties of two persons each is *prima facie*, the owner of the bed of the river to the central line of the stream, or, as it is termed, *ad medium filum aquæ*.

When the Crown assumed sovereign rights over the Australian Colonies, then known collectively as New Holland, the beds of all the rivers, navigable or not, became vested in the Crown in the same way as the *terra firma* itself. And the Crown at this day is the absolute owner of the beds of all rivers (which in England would be considered *prima facie* the property of the frontage proprietors *ad medium filum*) so long as the ownership of the frontages to those rivers remains in the Crown. But it is probably settled law, since the decision in Lord v. the Commissioner of the City of Sydney, a case which went home afterwards on appeal to the Privy Council, that upon the alienation in fee of frontages to rivers which are not navigable, and in which the tide does not ebb and flow, the ownership of the beds of such rivers passes to the *alienee ad medium filum*.

It is apprehended that derivative riparian rights can be claimed by a Lessee of Crown Lands or by any person deriving title through alienee of riparian land.

It is also apprehended that no riparian rights in the proper sense of the expression attach to ownership of the frontage to a lake, pond, or other stagnant water.

In England if a private river is subject to the right of public navigation (a very common case) the owners of the bed may, as against the public, do what they like with the water and the bed of the river, provided they do not obstruct the navigation.

That is a case which I do not think can occur in this Colony.

In this Colony a large number of rivers are navigable only at certain seasons of the year, and some are only navigable after floods or exceptionally wet seasons.

Nevertheless, I think it would be held by our Courts that a river once navigable remains always a navigable river, and that in that case the Crown does not part with its estate in the bed of such a river. What, however, would be considered to constitute navigability in regard to the draught of water of the navigating vessel, it is difficult to say. The point has never arisen, and indeed very few cases have come before our Courts in which riparian rights have come up for consideration or determination, or in which the public or private character of our rivers, streams, and watercourses has been considered and defined.

The following extracts from decisions of high authority comprise nearly all the common law doctrine in respect of riparian rights to the use of flowing waters which are likely to be of any practical use to the Commission:—

In *Tyler* v. *Wilkinson* (4 Masons U.S. Reports 397), Mr. Justice Story laid it down that "*prima facie* (*i.e.*, the law presumes) every proprietor upon each bank of a river is entitled to the land covered with water in front of this bank to the middle thread of the stream, or, as it is commonly expressed, *ad medium filum aquæ*. In virtue of his ownership he has a right to the use of the water flowing over it in its natural current, without diminution or obstruction."

In *Embrey* v. *Owen* (6 Exch. Rep. 369) a Judge of the greatest eminence, Baron Parke, stated it as a clear proposition of law that the right to have the stream to flow in its natural state without diminution or alteration is an incident to the property in the land through which it passes; but flowing water is *publici juris*,

juris, not in the sense that it is a *bonum vacans* to which the first occupant may acquire an exclusive right, but that it is public and common in the sense only that all may reasonably use it who have a right of access to it; that none can have any property in the water itself, except in the particular portion which he may choose to abstract from the stream and take into his possession, and that during the time of his possession; but each proprietor of the adjacent land has the right to the usufruct of the stream which flows through it.

The logical consequences following from the principle that no riparian proprietor has any *property* in the water, but only the user of it as it passes along, are thus expanded by Mr. Justice Story, in the leading case of *Tyler* v. *Wilkinson* cited above:—

"The consequence of this principle is, that no proprietor has a right to use the water to the prejudice of another. It is wholly immaterial whether the party be a proprietor above or below in the course of the river, the right being common to all the proprietors on the river; no one has a right to diminish the quantity which will, according to the natural current, flow to a proprietor below, or to throw it back upon a proprietor above. This is the necessary result of the perfect equality of right among all the proprietors of that which is common to all. The natural stream, existing by the bounty of Providence for the benefit of the land through which it flows, is an incident annexed, by operation of law, to the land itself. When I speak of this common right, I do not mean to be understood as holding the doctrine that there can be no diminution whatsoever, and no obstruction or impediment whatsoever, by a riparian proprietor in the use of the water as it flows, for that would be to deny any valuable use of it. There may be, and there must be allowed to all, a reasonable use. The true test of the principle and extent of the use is—whether it is to the injury of the other proprietors or not. There may be a diminution in quantity, or a retardation or acceleration of the natural current indispensable for the general and valuable use of the water, perfectly consistent with the common right. The diminution, retardation, or acceleration, not positively and sensibly injurious, by diminishing the value of the common right, is an implied element in the right of using the stream at all. The law here, as in many other cases, acts with a reasonable reference to public convenience and general good, and is not betrayed into a narrow strictness, subversive of common sense, which would destroy public rights. The maxim is applied, *sic utere tuo ut alienum non ludas.*"

As to the extent and nature of a riparian proprietor's right to the flow of water, the following extract from the judgment of the Privy Council in *Miner* v. *Gilmour*, a Canadian case, 12 Moore P.C. 156, may be useful:—

"By the general law applicable to running streams, every riparian proprietor has a right to what may be called the ordinary use of the water flowing past his land; for instance, for the reasonable use of the water for his domestic purposes and for his cattle, and this without regard to the effect which such use may have in case of a deficiency upon proprietors lower down the stream. But further, he has a right to the use of it for any purpose, or what may be deemed the extraordinary use of it, provided that he does not thereby interfere with the rights of other proprietors either above or below him. Subject to this condition, he may dam up the stream for the purpose of a mill, or divert the water for the purpose of irrigation; but he has no right to interrupt the regular flow of the stream if he thereby interferes with the lawful use of the water by other proprietors, and inflicts upon them a sensible injury."

Difference in English and Australian conditions.

The doctrine of riparian rights as enunciated above appears better adapted to England, where the people are more concerned to drain off the water as quickly as possible than to New South Wales, where the all-important question is how best to retain it. The unwritten law may be appealed to by a riparian proprietor to restrain the action of those who construct works which have the effect of depriving him of participation in the advantages of a flowing stream, or who makes such a diversion of the water as would inundate his land; but the position with which we have to deal is not so much with flowing water as with dry channels through which water flows only at long and irregular intervals. It is required that these watercourses should be made to hold water—to be in effect converted into inundation canals; but this would not be possible under the present state of the law, by which any litigious person could if so minded interpose a bar to the erection of weirs or other works. We believe there is a large amount of uncertainty as to what the application of the common law of England would be in cases which might be brought before the Courts, inasmuch as those cases would be founded upon circumstances entirely novel, and to which no analogy could probably be discovered in causes tried elsewhere. A few out of many cases which could be supposed have been stated by Mr. Oliver (*Vide University Review*, July, 1882), in support of the view that special legislation is urgently needed "to define rights and prevent wrongs."

Cases like the following occur repeatedly: A constructs a dam, say half a mile long, across a shallow watercourse. This dam prevents any average rainfall from benefiting the lower runs of B, C, and D. Can B, C, and D cut that dam and remove the obstruction? Or suppose a heavy rainfall, and flood-water escaping at the extremities of the dam, converts the runs of B, C, and D into a swamp, without re-entering the line of the watercourse. What redress has B, C, or D? These are cases likely to recur no many runs in the district under consideration. Again, is a lessee entitled to construct a weir in a permanent or any other watercourse, in order to divert flood-water over his run? And if so, under what conditions? There is no power, express or implied, given to a lessee to cut a channel through ever so narrow a strip of his neighbour's run, in order to take water from a river to a billabong or watercourse, and so to perhaps a score or more waterless back runs. Can he exercise the power, even if the strip is made part of a reserve?

Further,

Further, suppose that A excavates the site of a large dam or tank, and that before rain comes B and some other employés, having had a quarrel with A, free-select the site. Or suppose the same thing happens in case of a well sunk for artesian water, a few hundred feet, but without tapping water. In either case, it is said, is a dam, tank, or well without water considered an improvement capable of barring selection. What is A's remedy? Has he any at all in the first case? And in the second, is it to take up a 40-acre mineral conditional purchase at 40s. per acre, or apply for a special lease at (say) £10 per annum for five years? Or suppose this same A constructs a large dam, and a series of wells and tanks, sufficient to serve five or six blocks of 25 square miles each; no rain comes to fill them; he however applies for an extension of his lease under that 15th section of the Occupation Act already noticed, is he entitled to the extension?

Retention of rights by Victoria.

The sister Colony of Victoria has not parted with this riparian right, except, perhaps, in the case of a few old grants made before the Colony enacted its own legislation on the subject. We are not aware of the extent to which riparian rights have been alienated in this Colony, but we apprehend that there ought to be no difficulty in superseding the presumption of the English Common Law by a clear enactment of State ownership; for the common law, as we understand it, only gives a riparian owner power to use so much of the water of a river as he requires for his own consumption and that of his stock, while the object and effect of the principle of State-ownership would be to increase the supply of water which now often wholly fails, and to make it permanent. We do not imagine that the rights of riparian owners, when water is provided for their requirements, can give any claim to compensation. If, however, we had reason to think otherwise, we should still be of opinion that State-ownership to all rivers and watercourses is so essential to any widely beneficial scheme for providing and supplying water as to make it desirable that the Government should resume the title to ownership by giving compensation. Public policy hitherto has jealously asserted the right of the State, or of municipal bodies delegated by the State to all the main arteries of communication such as roads and streets, and has kept in the hands of the Government the sole right to construct and manage railways (with few immaterial exceptions), and telegraphs; and when the value of the water-courses of the country come to be properly estimated it will be seen that the policy which is designed to protect the interests of the community as a whole against the exactions of private monopolies should be applied to water conservation as it has been to roads, railways, and telegraphs, to which it is quite as applicable, if not indeed far more so.

Private enterprise.

By the above provision for State ownership over all rivers and watercourses we do not propose to prohibit private enterprise by capitalized companies or syndicates for the purpose of undertaking works for the irrigation of land, for the water supply of towns, and for the promotion of the mining and manufacturing industries. On the contrary, we recommend that certain concessions and privileges, with regard to diverting water from any stream or river, and as to the use of such water supply, should be granted to such companies or syndicates: Provided always that the works necessary for any such enterprise do not interfere with any general system of irrigation, and shall be of public utility, that the purpose of such enterprise shall be first submitted to Parliament in the shape of a Private Bill, and that such privileges shall only be granted for a limited period, according to the cost and character of the enterprise.

LEGISLATION FOR THE CONSERVATION AND UTILIZATION OF WATER IN NEW SOUTH WALES.

In considering the subject of Legislation on Water Conservation we have examined the enactments which have been passed on the subject of water conservation and supply in the various countries which seem most likely to furnish examples worth imitation, and have drawn conclusions therefrom which are embraced in the form of a rough draft of a Bill.

Though we suggest the provisions herein mentioned as only the most important points in the outline of required legislation, still, in preparing even a rough draft of an Act, it seemed best to follow the phraseology adopted in legal enactments.

Reasons in favour of the majority of the clauses are given in the notes after the various chapters. In the cases in which no explanations are given it was deemed that none were required.

For convenience and system of arrangement, we have divided the subject under parts or chapters as follows :—

PART I.—*Preliminary.*
PART II.—*Definition of Water-rights.*
PART III.—*National Administration—Board.*
PART IV.—*District Administration—Local Water Trusts.*
PART V.—*Loans—how sanctioned, incurred, and repaid.*
PART VI.—*Drainage Works.*
PART VII.—*Navigation.*
PART VIII.—*Offences and Penalties.*

NEW SOUTH WALES.

An Act to provide for the Conservation and Utilization of Water for Irrigation and other purposes.

Preamble.

WHEREAS it is expedient to define the public right in all rivers and streams flowing in natural courses, and in all lakes or other natural collections of still water, and to establish a system for the conservation and distribution of the water flowing or contained in such rivers, streams, and lakes, whether above or beneath the surface of the ground: Be it therefore enacted by the Queen's Most Excellent Majesty, by and with the advice and consent of the Legislative Council and Legislative Assembly of New South Wales, in Parliament assembled, and by the authority of the same, as follows, that is to say :—

PART I.—PRELIMINARY.

Title of Act.

1. This Act may be called "The Water Conservation and Utilization Act," and it shall come into force on receiving the sanction of the Governor.

Repeal of portions of Act at variance with this.

2. So much of the "Municipalities Act of 1867," and of "The Country Towns Water and Sewerage Act of 1880," as is repugnant to the provisions of this Act in respect of the construction or maintenance of work, or the storage, distribution, or supply of water, or in respect of the borrowing of money, the valuation of property, and the fixing and levying of rates, is hereby repealed, but only so far as the said enactment might be construed to control or limit the provisions of this Act.

NOTES AND EXPLANATIONS.

Notes and Explanations regarding PART I.

In the preamble of the Bill we have adopted the same style as in the Country Towns Water and Sewerage Act of New South Wales, but the wording of the important part of it follows closely the preamble of the Northern India Canal and Drainage Act. The name proposed for the Bill is suggested as being both brief and comprehensive. **Preamble and name**

2. The Acts mentioned in section 2 would, in some respects, interfere with the administration of this Act. The method of dealing with these Acts is precisely that adopted under similar circumstances in section 2 of the "Country Towns Water and Sewerage Act of 1880." **Repeal of certain clauses in Acts.**

Repeal of parts of Mining Act of 1874.

3. Section II, paragraph 15, of the "Mining Act of 1874," is hereby repealed absolutely, and all other portions of the same Act which are at variance with this Act are also hereby repealed, but only so far as the said Mining Act might be construed to control or limit the provisions of this Act.

Definitions.

4. In this Act, unless there be something repugnant in the subject or context, the following terms in inverted commas shall have the respective meanings hereby assigned to them :—

"Government"—The Governor, with the advice of the Executive Council.

"Minister"—The Colonial Secretary for the time being, or other member of the Government acting on his behalf.

"Board" or "Central Board"—The Central Board for Water Conservation and Utilization as constituted under this Act.

"Trust" or Water Trust"—Any Local Council appointed under the terms of this Act to design, construct, administer, or maintain local works for water conservation and utilization, or for drainage.

"Trust District"—The portion of the Colony included within the jurisdiction of a Trust as constituted by this Act.

"Water rights"—The right, title, and interest to a supply of water from any source, whether above or beneath the ground.

"River"—Any stream of water, whether perennial or intermittent, flowing in a natural bed or course, either above or beneath the surface of the ground.

"Lake"—Any lagoon, swamp, lake, or other collection of still water, whether this supply of still water be permanent or temporary, and whether it is found above or beneath the surface of the ground.

"Domestic use"—When employed with reference to water supply, includes use for drinking, culinary operations, baths, and washing; but does not include use for irrigation of gardens, or for watering or washing stock.

"Stock"—Cattle, horses, sheep, and all other domestic animals.

"Watercourse"—Any stream of water of smaller dimensions and discharge than would entitle it to the name of "river" as this term is generally understood, whether such stream of water be permanent or intermittent, and whether its flow be above or beneath the ground, or partly above and partly beneath.

PART II.—Definition of Water Rights.

5. To the Crown belong—subject to the provisions of section 6 of this Act :—

State rights.

(*a*) The water flowing or contained in every river, stream, creek, or watercourse, whether the said river, stream, creek, or watercourse be permanent or intermittent, and whether the whole or only portion of the land through, under, or adjacent to which such flow takes place belongs to the Crown.

State property in lakes.

(*b*) The water contained in every lake, swamp, lagoon, or other collection of still water, situated wholly or partially within or under Crown Lands, whether the supply of water in such lake, swamp, lagoon, or other collection of still water be permanent or intermittent.

State property in lakes.

(*c*) The water contained in every lake, swamp, lagoon, or other collection of water supplied wholly or partially by a river, stream, or creek, belonging to the Crown, whether such lake, swamp, lagoon, or other collection of water be situated on, within, or under Crown Lands or private lands, or lands belonging partly to the Crown and partly to private individuals.

NOTES AND EXPLANATIONS.

3. This paragraph regarding miners' rights is required to prevent confusion, and to bring the administration of the water supply under one complete system. It is believed that, under the arrangements now proposed, namely, the constitution of Water Trusts, the supply of water for mining purposes and for the domestic use of miners will be placed on a much more satisfactory footing, and in a more favourable position for the development of private enterprise. Miners' rights.

Notes and Explanations regarding PART II.

5. This section and the next are among the most important in the Bill, and must be accepted as the basis of legislation. In California and Colorado the future prospects of remunerative irrigation are seriously imperilled, either by a want of a clear definition of the State rights, or by neglect to maintain those rights, or by pernicious legislation, through which permanent right to rivers has been wholly or partially transferred to private individuals. In Italy, France, Spain, and India, questions regarding water rights and the conservation and distribution of the water supply have been practically set at rest by successful and beneficial legislation. In Article 420 of the Italian Civil Code, the following rule is stated regarding the rights of the State:—"The rivers and torrents, and generally all those portions of the territory of the State which cannot become private property, are considered as dependencies of the royal domain." Article 33 of the Spanish Law of Waters is as follows:—"There pertain to the public or public property

(i) The waters which spring perennially or intermittently within the public lands.
(ii) Those of the rivers.
(iii) Those, whether perennial or intermittent, of the springs and torrents which flow through their natural channels."

Similar regulations prevail in France. In India the preamble of the Northern India Canal and Drainage Act begins with the words—"Whereas throughout the territories to which this Act extends the Government is entitled to use and control for public purposes the water of all rivers and streams flowing in natural channels and of all lakes and other natural collections of still water," thus assuming the Government right as a starting-point for legislation. The declaration of the rights of the Crown in a river or lake bed is necessary, though we have not found it clearly enunciated in any legal enactment. It is, however, mentioned by Mr. W. H. Hall in his work on "Problems of Irrigation," that in France "the tendency of decisions and administrative rulings is towards a declaration of ownership by the nation of the beds of streams, so long as they are occupied by the waters." Definition of State rights.

State right to springs.

(*d*) All springs situated within Crown Lands, and all springs whether situated in Crown Lands or in private property which have overflowed into or contributed water to any river, creek, stream, or lake, belonging to the Crown.

Right of Crown to bed of rivers and lakes.

(*e*) The right to control for the purposes of this Act the land covered either permanently or intermittently by the water of any river, creek, stream, or lake.

6. The owner, lessee, or occupier of any land shall in virtue of such ownership, occupation, or right of possession, have a right to the use of water as follows, that is to say :—

General limit to private ownership of water.

(*a*) The whole of the rain which falls on such land, with the exceptions or additions described in section 7.

Riparian rights limited.

(*b*) So much of the water of any river, stream, creek, lagoon, or lake adjoining such land as is required by the said owner, lessee, or occupier, for domestic use and for the watering of stock, provided always that no owner, lessee, or occupier of such land shall have a right to a larger supply of water than at the rate of 2,000 gallons per day for every mile of river, or lake frontage.

Rights already acquired.

(*c*) Any rights, whether permanent or temporary, which have been acquired under the Mining Act of 1874 or under any other Act or regulation in force prior to the passing of this Act.

Right to springs.

(*d*) The exclusive right to the use of any spring of water rising or situated in such land, if neither any other person or persons, nor any corporation, nor the Government has acquired a right to such spring or to a portion of the water from it by uninterrupted use for a period of not less than twenty years.

Right of landowner to underground supply.

(*e*) All the water found under the surface of such land, and the said owner, lessee, or occupier may make any lawful use of such underground supply ; but no owner, lessee, or occupier of land has a right to use the underground supply in such manner or to such extent as to affect injuriously the supply in any well or boring previously existing in any adjoining property.

Acquisition of water-rights.

7. Whenever the owner, lessee, or occupier of any land has been for a period of not less than twenty years allowed the use free of charge or hindrance of a supply of water, whether permanent or intermittent, running from or through or situated in any other land, such owner, lessee, or occupier shall have a permanent right to the use of such supply of water; but the water to which a right may in this manner be acquired may be used only for domestic purposes and for watering stock.

Limitation of acquired rights.

8. Wherever a right has been established to a supply of water from or through any land not owned, occupied or leased by the person or persons by whom such right has been acquired, the owner, lessee, or occupier of such land may appeal to a Water Trust or to the Board for a limitation of such right, and when making such appeal shall send a copy thereof to the person who has established the said right. After the service of such notice of appeal, the person who has established the said right will have no power or authority to take from the same source any water in excess of the quantity which he has already been in the habit of obtaining, unless and until the Board or the Local Trust having jurisdiction in the district in which such supply is situated shall otherwise order or permit.

Compensation for interference with water-rights.

9. Any person who has under this Act a right to a supply of water from a river, creek, stream, lagoon, or lake, or from any spring, or from any underground source, may claim and obtain compensation if such supply be prejudicially interfered with by the construction of any canal, channel, cutting, well, or boring, or by the erection and working of any machine, or by any other means whereby such supply of water has been diminished in quantity or rendered less useful than it was previous to the construction, erection, or bringing into operation of any such means of interfering with the supply; but on the person

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Individual rights to water.

6. The rights of private individuals are dealt with in this section, and the statement of ownership to water is on the lines of the Spanish Law of Waters, in which Article 30 is as follows :—"There belongs to the owner of an estate the rain water which falls or is collected on it while passing through it ; he may, in consequence, within his own property, construct cisterns, tanks, ponds, or reservoirs to preserve it, always providing it does not injure the public or third parties." The definition of the extent of riparian rights is based partly on Article 166 of the Spanish Law of Waters, which lays down the rule that "while waters run through their natural and public channels all may use them for drinking, washing clothes, vessels, or any other kind of object, for bathing, or watering or washing horses and cattle, subject to the rules and restrictions of municipal police." Regarding the limit to the quantity allowed to a riparian owner or occupier, we have assumed that 2,000 gallons per day is the maximum quantity which a riparian owner or occupier would require for domestic use and for the stock, which could receive a supply direct from the river or lake, under the terms of this Act. As already explained in the notes on Part I, this Act is intended to provide for the conservation and distribution of water for all purposes, and the Trusts constituted under it may be Trusts for irrigation or for pastoral or mining purposes. After the passing of this Act, water rights can be obtained only in accordance with its provisions ; but it is necessary to recognize existing rights of miners and of others who have acquired water rights in a legal manner, and clause (*c*) of this section is intended to meet such cases. Clauses (*d*) and (*e*) of this section on the subject of rights to springs and underground supplies are in accordance with Article 33 of the Spanish Law of Waters, which has already been quoted, and also in accordance with Article 540 of the Italian Civil Code, which is as follows :—"Whoever has a spring on his estate may use it at his pleasure, saving the right which the owner of a lower estate may have acquired by title or prescription."

Acquisition and limitation of water rights.

7. and 8. These sections, dealing with the acquisition of right to water and the limitation of those rights, are in accordance with principles of equity, and in harmony with the spirit of this Act.

Onus of proof.

Principles on which compensation can be granted.

9. Section 9, throwing the onus of proof on claimants for damages in cases concerning water rights, and defining the principles on which compensation can be obtained, is based to some extent on the Indian Canal Act.

Onus of proof of claims.

making any such claim for compensation will rest the onus of proof that actual damage has been done to him, and no compensation shall be allowed unless the said claimant shall prove that he is unable to obtain as much water of useful quality as he was in the habit of obtaining prior to the abstraction of the supply on account of which compensation is claimed.

Restrictions as to conveying water to a distance from source of supply.

10. Wherever the owner, lessee, or occupier of land adjoining a river or lake has already arranged or wishes to arrange for the abstraction or diversion of a supply of water for domestic use, or for the use of stock, and for the conveyance of such supply whether in natural or artificial channels to a distance of more than 1 mile from such river or lake, a license for the abstraction or diversion of such supply must be obtained from the Board or from the Water Trust having jurisdiction in such case. Wherever supplies for domestic use or for stock are now being conveyed or diverted from any river or lake to distances exceeding 1 mile from such river or lake, the owner, lessee, manager, or user of such arrangement or appliance must, within three months after the passing of this Act, obtain a license for the further use of such arrangement or appliance.

Frontage, how measured.

11. Frontage to a river or lake, as referred to in section 6 or elsewhere in this Act, shall be taken to be the length measured along the edge of the water in a river or lake at the time of abstraction or diversion of the supply.

Limitation of water-rights.

12. No owner, lessee, or occupier of land adjoining a river or lake has any right, power, or authority to interfere in any way with the flow or the supply of water in such river or lake except to the extent and for the purposes detailed in this Act.

Waste of water prohibited.

13. No owner, lessee, or occupier of land adjoining a river or lake has a right to abstract or divert from such river or lake for domestic use or for stock a larger supply of water than he requires. Any breach of this regulation or any loss of water through defective channels or other causes shall render the defaulter in such case liable to the penalties fixed under this Act for waste of water.

Rights of Municipality not to be interfered with.

14. Wherever any arrangements have been made, or are in progress, or have been officially proposed, in connection with the drainage or the water supply of any Municipality or union of Municipalities, such arrangement or proposed arrangement shall not be in any way intefered with by the Board or by any Water Trust except by agreement with such Municipality or union of Municipalities.

Right of riparian owners to use of beds of rivers and lakes.

15. Where water ceases to flow or to be stored over the whole or a portion of the bed of a river, creek, stream, or lake belonging to the Crown, the owners, lessees, or occupiers of the adjoining land have a right to the use of the land thus left clear of water; provided always that the bed of such river, stream, or lake shall not be used in such manner as to alter, diminish, or retard the flow of water in any river or stream, or diminish the holding capability or capacity of any lake.

Present trespass on Crown rights.

16. Wherever in contravention of Crown rights a supply of water has been drawn from any river, creek, stream, lagoon, or lake, whether by pumping or other lifting machinery, or by artificially raising the water level, or by canals, drains, or pipes, or by any combination or modification of these means, the works so done and the machinery or appliances so used shall, after the passing of this Act, be inspected and reported on by an officer acting for or empowered by the Board; and if the continued operation of such works, machinery, or appliances be not detrimental to public interests a license shall be granted to the owner, lessee, or manager of such works under such conditions as the Board may deem necessary in the interests of the Government, and such license must be renewed at least once in every five years.

Limit of time for application for license.

17. If in any case after such inspection of works, machinery, or appliances as described in section 15, which have been used, or are intended to be used, for the purpose of obtaining a supply of water from a river, creek, stream, or lake, the owner, lessee, or manager of such works, machinery, or appliances neglect to apply for a license

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License required for conveying a supply of water more than 1 mile.

10. This regulation that a license should be obtained for permission to carry water from a river or lake to a distance of more than 1 mile from such river or lake is suggested chiefly in order that the arrangements for the conveyance of the water should be more directly under the control of the proposed Board. It need scarcely be pointed out that it would be easy to convey water in such a manner as to irrigate a strip of land by means of the water escaping by percolation or otherwise from the channel conveying it. This would be an evasion of the regulation that water used for irrigation must be paid for; any such evasion would be prevented by a license which could be cancelled if its terms were not strictly attended to.

Definition and limitation of riparian rights.

11 and 12. These sections are necessary corollaries to 6 in regard to the limitation of water rights.

Prohibition of waste

13. The prohibition of waste is a useful point, and one which has been found necessary in all cases where anything like complete legislation on the subject of water conservation has been carried out. The Italian rule on this point is that "irrigators who have legitimate titles to water their lands possess no right to the surplus waters, which shall be allowed to flow freely to the rivers, for the benefit of proprietors below." "The Northern India Canal and Drainage Act" orders a penalty for waste of water under any circumstances where proper precautions have not been taken.

Exemption of Municipalities.

14. This paragraph is intended to exempt from the operation of this Act all towns and municipalities which have already acquired vested interests in any river or stream, or in any catchment area.

Private rights to beds of rivers and creeks.

15. The right of riparian owners or occupiers to the use of the beds of rivers or lakes appears to be generally understood; but we have not found it clearly enunciated in any recent legislation. There is no question of the necessity for a clear statement of the law on this subject.

Trespass on Crown rights.

16. It is well known that in a number of cases water has been and is now being taken from rivers and lakes for irrigation and other purposes. These works are the result of private enterprise, and the owners of them should be dealt with in a liberal spirit. Still such works must be carried out and maintained only under Government sanction, and as those in existence have been carried out without any legal right or sanction no time should be lost in putting these matters on a proper footing. That their owners understand that the works of this kind which are in existence have been carried out and maintained under sufferance only was shown by the evidence of at least one important witness examined by the Commission. This gentleman, who has pumping machinery erected on the Murrumbidgee, stated that he was quite prepared for the contingency of being required by the owners of property further down the river to suspend or stop his pumping operations.

Limit of period for application for license.

17. This section is a necessary sequel to the last.

within ten days after the notification of the result of such inspection the said owner, lessee, or manager shall be liable to the penalty fixed by this Act for illegally using water.

PART III.—National Administration—Board.

Appointment of Board.

18. For the management under this Act of all rivers, streams, creeks, lakes, springs, and underground supplies of water in the Colony of New South Wales, it is hereby ordered that a Board for Water Conservation and Utilization shall be appointed without delay after the passing of this Act.

Constitution of Board.

19. The Board shall consist of a Chairman or President and members. The Chairman of the Board shall be a permanent Government officer specially appointed for the purpose of the administration of this Act, and shall devote the whole of his time to the duties of this office. The members of the Board shall also be appointed by Government, and shall hold office permanently, but their duties shall extend only to attendance at meetings of the Board and the despatch of business brought before such meetings.

Duties of Engineer to the Board.

20. The Government shall appoint an Engineer, whose duty it will be to examine into and report on the propriety, practicability, and probable results of work proposed by Trusts, and to carry out works undertaken by the Government.

Establishment, permanent and temporary.

21. The Government shall have power to appoint any further permanent or temporary staff necessary for the administration of this Act.

Powers of the Board

22. Subject to the sanction of Government, the Board shall have authority to fix the boundaries of districts to be administered by Local Trusts, and to alter, enlarge, diminish, unite, or separate such Trusts and Trust Districts, and to alter the name of any Trust or Trust District.

Works for water conservation to be inquired into and sanctioned by the Board.

23. The Board shall inquire into and decide on the propriety of sanctioning any work for water conservation and utilization, or for drainage, proposed by any owners, lessees, or occupiers of land, or by a local Trust. If such works appear to the Board to be of a proper and useful description, and if no loan be required by the Trust for the carrying out of such works, the Board may sanction the commencement and prosecution of such works by the said owners, lessees, or occupiers of land, or by the said Trust.

Projects for which loans are applied for by Trusts.

24. When a Trust proposes to carry out works for the purpose of the conservation and utilization of water, or for drainage, and applies for a loan guaranteed by Government to enable it to complete such works, the Board shall examine the plans and estimates of such works, and shall require the aforesaid Trust to supply any further information which may appear necessary. The Board may also, through its officers, carry out such levels, surveys, measurements, and investigations as may be required to furnish a satisfactory check on the surveys, designs, and estimates for the proposed works. The Board shall then report to Government on the propriety, feasibility, and cost of the proposed works, and on the profit likely to be obtained from the construction of the said works, and shall make such recommendations to the Government as it may deem just and necessary in regard to the propriety of granting the whole or a portion of the loan applied for.

Works carried out by Trusts to be subject to approval of Board.

25. No work, whether for water conservation and utilization, or for drainage, which affects in any way the rights of the Crown, as described in section 5 of this Act, shall be undertaken without the sanction of the Board; and every such work, whether carried out by a Trust, or by the owner, lessee, or occupier of land, shall, both as to construction and maintenance, be subject to the inspection and approval of the Board or its officers.

Tenders to be called for publicly.

26. Tenders for works for water conservation and utilization, or for drainage, whether such works are to be carried out under the direct management of the Board or under Trusts, must be called for by public

NOTES AND EXPLANATIONS.

Notes and Explanations regarding PART III.

It may be remarked here at the outset that the necessity for a Board was in a large measure suggested by the defects in Victorian legislation, as pointed out by the Secretary to the Commission in his Report on the Conservation of Water in Victoria.

Appointment of Board.

18. The appointment of a Board, as proposed in this section, will ensure the administration of water conservation and supply on a complete and uniform system, while the organization of Water Trusts will provide for attention to local wants and the economical treatment of details and maintenance. It appears to us that, by the appointment of the Board here proposed, the weak points in the Victorian legislation, which have been remarked on in the Secretary's Report already referred to, will be provided against. An attempt is now being made in India to place the maintenance and management of irrigation distributaries under the charge of the village communities benefiting by them. The system there aimed at is almost an exact parallel to that now proposed. The Board would have powers similar to those possessed by the Irrigation Department, while the village communities would be in the position of Local Water Trusts. In the south of France the irrigation works, with the exception of the Marseilles Canal, which is only partially intended for irrigation purposes, are carried out and managed under a system almost identical with that now suggested. There the Public Works Department of France occupies almost the same position as that of the Board, while the Associations of Landholders correspond very closely with the Water Trusts.

Power of Board to define Trust Districts.

22. The power of the Board to settle the boundaries of Trust Districts, subject to the sanction of Government, is similar to that reserved to the Government of Victoria, in Act 778 of 1883.

Duties and powers of Trusts.

23 to 28. These sections are specially intended to provide against the defects pointed out by the Secretary of this Commission, in his Report to the President regarding Victorian water conservation.

advertisement in the same manner as in the case of Government contracts. If the tenders have been advertised for by a Trust, and if the proposed works are intended to be constructed wholly or partially by money lent or guaranteed by Government, such Trust shall examine the tenders and shall forward them to the Board, with a report stating the opinions of the said Trust regarding the tenders. The Board shall then decide which tender shall be accepted, and shall direct the local Trust accordingly.

Acceptance of tenders for works to be carried out by loans.

Loan works to be carried out by contract.

27. When works are carried out by Trusts, with the aid of funds lent or guaranteed by Government, only contract work shall be engaged, and the terms of every such contract, and the nature and amount of security required, must be approved by the Board before tenders are invited.

Accounts of Trusts to be open to inspection.

28. The certificates and vouchers for all payments for work done by Trusts, with the aid of loans obtained from or guaranteed by Government, must be countersigned by the Chairman and Engineer of the Board, and all accounts in connection with such works shall at all times be accessible for inspection by the Board and its officers.

Powers to make surveys and carry out works.

29. Subject to the sanction of the Government, the Board, through its own officers, aided, if necessary, by a temporary staff, may carry on surveys and prepare designs and estimates for work. It may also, subject to the same provision, call for tenders and carry out works for water conservation and utilization, or for drainage.

Local works to be managed by Local Trusts.

30. On the completion of works carried out under the immediate directions of the Board, the charge of the maintenance and administration of such works shall, as soon as can be arranged, be transferred by the Board to one or more Water Trusts.

Powers of Board.

31. For the purposes of this Act the Board shall have power, by itself or its officers, or by Water Trusts or their officers, to enter on any land, remove any obstruction, close, open, or alter in any way any channel, stream, creek, or river, take levels, make surveys and measurements, and do any excavation or construct any works, or do anything that may appear necessary or expedient in connection with any works, whether such works be done or are in progress, or proposed to be done. The Board may also resume, purchase, or lease any water privileges which may have been acquired previous to the passing of this Act.

Compensation to be paid for damage done under this Act.

32. Whenever any person employed in pursuance of this Act shall, while in the execution of his duties, cause injury to land or fences or other property, or shall cause loss or damage to any owner or occupier of land or other property, the Trust or other authority under which such person is employed shall be liable for all such injury, loss, or damage.

Limitation of time within which claims will be admitted.

33. Claims for compensation on account of injury, loss, or damage caused to persons or property by any person employed under this Act, must be made within one month after such injury, loss, or damage is sustained; and no claims of such description made after the lapse of more than one month from the date of occurrence of such injury, loss, or damage, shall be valid, unless satisfactory reason be shown for the delay in preferring such claims.

Compensation may be settled by arbitration.

34. When any person claims compensation from a Trust on account of injury, loss, or damage sustained, and such claim is disputed by the said Trust, the settlement of the amount of compensation (if any) may, with the joint consent of such Trust and such claimant, be submitted to arbitration. In such case one arbitrator shall be appointed by the said Trust and one by the said claimant; and should such arbitrators fail to agree as to compensation they shall appoint an umpire, whose opinion as touching the question or questions in dispute shall be final. If the amount awarded by such arbitrators be not at least two-thirds of the amount claimed as compensation, the said claimant shall pay all the costs and expenses of such arbitrators.

Power to obtain water-rights from Municipalities.

35. The Board shall, for the purposes of this Act, and with the sanction of Government, have the power to obtain from any Municipality, or combination of Municipalities, by agreement with the said

NOTES AND EXPLANATIONS.

29 and 31. In these sections the general powers of the Board are stated; the powers provided being similar to those secured to Government in India, in New South Wales, and in Victoria, in cases relating to the construction and management of public works. Powers of Board.

30. In this section the management of works for water conservation and supply is ordered to be placed in charge of those directly interested. This is the general practice in France, Italy, and Spain, and it is the practice aimed at in India, New Zealand, and Victoria. Management of water supply by Local Trusts.

Sections 32 to 34 inclusive, relating to the responsibility incurred through entering on land or interfering with property, declare the right of the owner of such land or property to compensation for actual damage done by such entry. These sections are based on legislation already in force in New South Wales, Victoria, and India. Claims and compensation.

35. This section is intended to provide for cases in which a portion of a supply is required for a town, while the remainder is available for irrigation and other purposes. Power of Board to make agreements with Municipalities.

Municipality or Municipalities, the whole or a portion of the water-rights possessed by the said Municipality or Municipalities, and referred to in section 14 of this Act.

Power to acquire or sell land.

36. The Board may also, for the purposes and subject to the provisions of this Act, acquire, purchase, or take on lease any land required for any work, and may sell, exchange, or let on lease any such land whenever it ceases to be necessary.

Procedure in the acquisition of land.

37. Before proceeding with the construction of any permanent works the Board shall publish, at least once in each of three consecutive weeks, in some newspaper circulating in the district in which the proposed works are situated, a notice stating the names of the owners or reputed owners of the land required, the situation of the land, and the acreage required from each of the various holdings. The notice shall also specify the place and hours at which a plan of the required land can be seen.

Notice of intended resumption of land

38. The Board shall serve a notice on every owner or reputed owner, lessee or reputed lessee, and occupier of such land, and shall define in the notice in each case the position and area of the particular land intended to be resumed, and requiring a reply stating the amount which the said owner, lessee, or occupier is willing to accept in settlement of compensation for the said land.

Amount of compensation, how arrived at.

39. In estimating the amount due as compensation to any owner, lessee, or occupier, the Board shall deduct from the value of the land resumed, and the damage done, the amount by which the remaining land of the said owner, lessee, or manager shall have increased in value through the sanction of the proposed work; provided always that such increase in value does not exceed the cost of the land resumed and the damage done. In no case shall the owner, lessee, or manager have a right to claim for resumed land the increased value due to proposed works.

Action in case of absence of owner or occupier of land.

40. If, through absence of the owner, lessee, or occupier of land proposed to be resumed, or from any other cause, the owner, lessee, or occupier fail to forward a statement of his claims within two months after the last date of publication of the notice by the Board no interest on the amount of compensation shall be allowed, and the increase in value of the remaining property of the said owner, lessee, or occupier up till the date of receipt of the said claims by the Board shall be reckoned, as in section 40 of this Act, in diminution of the compensation to be awarded.

Resumption of water rights.

41. The regulations ordered in the last two sections shall also, so far as they are applicable, be acted on in the purchase, resumption, or lease of water-rights.

Power of the Board to fix rates.

42. Wherever works have been carried out under the provisions of this Act with the aid of loans the Board or Trust will have power to fix rates and charges for water supplied from any source by means of the said works, and it shall also have power to prescribe or sanction methods and units for the measurement of such water.

Right of Board to inspect works.

43. The Board may at any time cause inspection to be made of any works for water conservation and utilization, or for drainage, which are under the management of a Trust; and may also, wherever Crown rights are affected, or believed to be affected, cause similar inspection to be made of such works which are under the management of the owners, lessees, or occupiers of land, and if the maintenance and management of such works be found so unsatisfactory as to cause waste of water the Board shall require such Trust or such owners, lessees, or occupiers of land to improve the maintenance and management of such works.

Power of the Board to cancel constitution of Trusts.

44. In any case where, as described in section 43, the members of a Trust, or the owners, lessees, or occupiers of land, manage or maintain works for water supply, or for drainage, in an unsatisfactory or discreditable manner, the Government may, on the report of the Board, withdraw all or any of such works from the control of the said Trust, or of the said owners, lessees, or occupiers of land, and may

NOTES AND EXPLANATIONS.

Powers to acquire or sell land.

36 and 37. The procedure here proposed is similar to that prescribed in the New South Wales Country Towns Water and Sewerage Act.

Compensation for land, &c.

38, 39, 40, and 41. It is assumed that on the sanction of the construction of a canal, reservoir, or other work for water conservation, or of any cutting for water supply or for drainage, an immediate rise in the value of adjoining land will take place. We have ventured to propose that, in estimating the compensation to be paid, this rise in the value of property should be taken into account to lessen the amount which an owner or occupier should receive. This course is not without precedent, and we think that the justice of it is manifest. The proposal seems reasonable, and in some cases this regulation might have an important bearing on the remunerativeness or otherwise of useful works. Section 39 is specially intended for dealing with cases in which miners' rights to water have been acquired, and with cases in which it would be advantageous to the public to obtain by resumption or otherwise water rights possessed by individual landowners, lessees, or companies.

Powers to fix rates for water, and methods and units of measurement.

42. The necessity for the portion of this paragraph bearing on the fixing of rates is at once obvious; but wherever there is no reason to the contrary, the rates for water should be fixed by the Local Trusts, subject merely to the sanction of the Board. With regard to the power of the Board to prescribe or sanction units and methods of measurement of water, it appears to be a better arrangement to give this general authority than to prescribe any method or unit in the Act. In no country has it been found practicable to follow one system or method of measuring water. Different modules for the measurement of water for irrigation and other purposes have been adopted in Italy, France, and Spain, and not only so, but several methods of measuring the water are adopted in each of these countries. For the purposes of an irrigation outlet, or for any small supply required from a canal or distributary, the module adopted on the Marseilles Canal appears least open to objection. In India, water supplied for irrigation is paid for according to the nature of the crop and the area irrigated, while that supplied for grain mills is charged for by the number and size of the millstones used; but it is not an uncommon practice for Government to build the mills and let them by public competition, on certain fixed terms regarding the quantity and regularity of the water supply.

Mismanagement by Trusts—how dealt with.

43 and 44. In the south of France, where, as already stated, the system of canal management is similar to that now proposed, it is found that the local associations, through either ignorance or carelessness, frequently allow irrigation works to fall into such disrepair as to cause waste of water and interfere with the efficiency of the works. This and other kindred evils are intended to be here provided against.

cancel the constitution of the said Trust, and may place all or any of the rivers, streams, creeks, lakes, and underground supplies of water within the district in which such works are situated under the immediate charge of the Board, to be managed and administered under this Act.

PART IV.—District Administration—Local Water Trusts.

Formation of Water Trusts.

45. Whenever the owners, lessees, and occupiers of land desire to combine for the purpose of constructing works for the conservation or utilization of water, or for drainage of land, a petition, signed by at least five of such owners, lessees, or occupiers, and setting forth the nature and extent of the works desired by the said owners, lessees, and occupiers, and the quality and extent of the land likely to be benefited by such works, shall be submitted to the Board by the said owners, lessees, and occupiers.

Board to inquire into propriety of forming Trusts.

46. The Board shall, without delay, investigate and inquire into the feasibility and propriety of the proposed works; and if after such investigation and inquiry the said Board shall deem it right and expedient that a Trust shall be formed for the survey, construction, maintenance, and administration of works for water conservation and utilization, or for drainage, the said Board shall, subject to the sanction of Government, order the appointment of the said Trust, and shall assign a name to the said Trust, and shall describe the boundaries of the district to which the jurisdiction of the said Trust shall extend, and shall define the limits of the water supply which such Trust shall be entitled to use and administer.

Formation of Water Trusts to be notified publicly.

47. The constitution of a Trust shall be publicly notified in the Government Gazette, and in at least one newspaper circulating in the district of the said Trust, and such notification shall state briefly the boundaries and name of the said Trust, and the number of representative members, and the names of the persons qualified to vote for members of the said Trust, and the date on which the first election of members of such Trust shall take place.

Boundaries of Trust District how decided.

48. In deciding the boundaries of Water Trusts the Board shall be guided by watershed lines, and by the position of rivers and other natural sources for water supply; and the Board shall, wherever practicable, arrange the boundaries of Trusts in such manner as to include one or more complete catchment areas.

Procedure of Board when organizing a Trust.

49. When making preliminary investigations and inquiries regarding the formation of any Water Trust, the Board shall prepare, or cause to be prepared, a list of the owners, occupiers, and lessees of land within the boundaries of the proposed Trust District; and this list must show the nature of tenure, the area, and the quality of the land held by each owner, occupier, and lessee in the said proposed Trust District. By means of this list the names of all persons entitled to vote for members of the said Trust and the numbers of votes which every such person will have a right to give will be determined.

Members of Trusts

50. The conservation and utilization of water, and the drainage of every Trust District, shall be managed and administered by members of the said Trust, who will be elected from time to time by the owners, lessees, and occupiers of land and the owners of miners' rights and leases within the said Trust District, and the number of members thus elected in every Trust shall be not less than three or more than nine.

Qualification of Trust representation.

51. In the Western Division of New South Wales, as constituted by the Land Act of 1884, every representative member of a Water Trust must either be owner of not less than 640 acres of land or lessee or occupier of not less than 10,000 acres. In the Central Division, as constituted under the same Act here mentioned, every representative member of a Water Trust must either be owner of not less than 160 acres of land or lessee or occupier of not less than 2,560 acres. In the Eastern Division, as constituted by the same Act here mentioned, every representative member of a Water Trust must either

NOTES AND EXPLANATIONS.

Notes and Explanations regarding PART IV.

In the Victoria Water Conservation Act of 1881, Part VII is devoted to powers conferred on private individuals. It appears to us that this part of the question could be better dealt with by making the definition of "Trust" more elastic, and including within the same regulations and the same administrative system all Water Trusts, however extended and however limited. All the regulations for Trusts here proposed are framed so as to suit Trusts whether large or small, and whether the water be conserved for and distributed to irrigation works, or to graziers, or to miners.

Procedure in constituting Trusts.

45 to 48. In these sections the procedure followed when constituting a Water Trust is detailed. In framing the proposed regulations the Victorian legislation has been only partially followed, as in some cases it is not applicable, and in others not sufficiently concise. The fixing of boundaries of Trust Districts here dealt with is a matter requiring judgment and care. The principle on which alone the boundaries can satisfactorily be dealt with is to follow the natural boundaries, that is, the ridge and valley lines, and not any artificial boundaries which have been fixed for municipal or other purposes.

Qualifications of members and of voters for Trusts.

49 to 54. These paragraphs deal with the qualifications of members and of voters for Water Trusts, and the main principles on which they are founded are those accepted in recent Acts to extend local government. It may be mentioned that the Victorian Water Conservation Act of 1881 orders that the appointment of Water Trust Commissioners shall rest with Municipal Councils. We entirely fail to see the propriety of such a course, and think that Water Trusts and Municipal Councils should be regarded as two entirely separate bodies, each dealing with the other as it would with a private individual or a private company. On the other hand, there is no reason why a municipal councillor should not also be member of a Water Trust, and no regulation is proposed which would be inimical to such an arrangement. The principle now advocated is, briefly, that members of Water Trusts should be elected by and from those interested in the equitable and economical distribution of the available supply.

be the owner of not less than 40 acres of land or the lessee or occupier of not less than 640 acres.

Qualifications of voters.

52. For the election of members of Water Trusts the owner, lessee, or occupier of not less than 1 acre or more than 640 acres shall have one vote for every vacancy; the owner, lessee, or occupier of more than 640 acres, and not more than 2,560 acres, shall have two votes for every such vacancy; the owner, lessee, or occupier of more than 2,560 acres, but not more than 10,000 acres, shall have three votes for every such vacancy; the owner, lessee, or occupier of more than 10,000 acres shall have four votes for every such vacancy.

Formation of Mining Trusts.

53. Wherever it is found impracticable for any Local Trust to deal with the mining and manufacturing interests within its district the Government may, on the recommendation of the Board, authorize the formation of Special Water Trusts for mining or manufacturing purposes only. The qualification for the representative membership of every such Trust shall be the registered possession of a mineral or special lease, and the qualification of voters in such Trust shall be the registered possession of a miner's right.

Method of recording votes.

54. The Secretary to a Water Trust, or other person authorized by such Trust or by the Board, shall, as soon as possible after the notification of the Constitution of such Trust, transmit by post or otherwise to every voter residing at a distance of more than ten miles from the nearest polling place a printed or written or partly printed and partly written ballot-paper containing the names of all the candidates qualified for the office of representative members; or if such voter have a right to more than one vote, then the number of ballot-papers supplied to the said voter shall be equal to the number of votes to which he is entitled. Votes should be recorded on the papers according to prescribed regulations, and every voter should sign all his voting papers and return them to the Secretary to the Trust in a cover stamped with the words "Voting Papers." Such covers will be transmitted free of charge by post, and shall, in every way, be treated as registered correspondence. Qualified voters residing within ten miles of a polling-place shall record their votes by ballot in the manner prescribed for Municipal Elections. The names of the Trust representatives so elected shall be notified in the Government Gazette, and in at least one newspaper circulating in the said Trust district.

Procedure on election of Trust representatives.

55. Within one month after the election of members of a Water Trust the said members shall meet at some convenient time and place to be sanctioned by the Board, and at that meeting, or at an adjourned meeting, the said members shall elect a Chairman, and shall transact such business as may be brought before them; and such members shall thereafter meet and adjourn as they think proper from time to time and from place to place. A special meeting of the members of any Water Trust may at any time be called, on the requisition of the Board or of the Chairman of such Trust, or on the requisition in writing of any two members of such Trust, addressed to the Chairman or Secretary of the said Trust.

Power to rest only with quorum of members.

56. All powers vested in a Water Trust may be exercised by such Trust at any meeting held in pursuance of this Act at which there is a quorum of the members present, but not otherwise.

Number required to form a quorum.

57. Whenever there is an even number of members in any Trust a quorum shall consist of not less than half the members of such Trust. When there is an odd number of members in any Trust the smallest number constituting a quorum will be half of the number obtained by adding one to the number of members.

Power of Board to alter number of members or quorum.

58. The Board, subject to the sanction of the Government, shall have power to alter the name of any Trust, or the number of members of any Trust, and also to alter in any Trust the number of members required to form a quorum.

Power to postpone or adjourn meetings.

59. If at any meeting of a Water Trust there be not a quorum present within half-an-hour after the time appointed for such meeting, then it shall be lawful for the members present, or the majority of them, or any one member, if only one be present, to adjourn such

55 to 62. The details of the system of procedure of meetings of local Trusts is based on the New South Wales Municipalities Act and the Victorian Act for the Conservation and Distribution of Water, but are arranged to suit the altered circumstances of Water Trusts. Procedure at meetings of Trusts.

meeting until another hour or another day; and if no member be present, then it shall be lawful for the Secretary to adjourn the proposed meeting till another hour or another day.

Members not to be paid.

60. No member of any Water Trust shall be the holder of any paid office or situation under the said Trust, nor receive any salary, emoluments, or expenses of any kind from the said Trust unless with the special sanction of Government and with the recommendation of the Board.

Members not to be contractors.

61. No member of any Water Trust shall tender for, obtain, or hold any contract or any part or share in any contract for works or surveys under the charge or authority of such Trust.

Penalty for illegally acting as members.

62. Every person who, being incapacitated or not duly qualified to act, or having become disqualified from acting as member of a Water Trust, is present at a meeting of the members of such Trust, and acts thereat as a member shall, for every meeting on which he is so present and acting, be liable on conviction thereof before any two Justices to a penalty not exceeding £50.

Trust to be a body corporate.

63. Every Water Trust shall be a body corporate, and shall, subject to the sanction of the Board, have power to purchase and hold lands, tenements, and hereditaments and other property for the purposes of this Act. It shall also, under the same conditions, have the power to sell, exchange, or let on lease the whole or any portion of such lands or other property for the benefit of such Trust.

Powers delegated by Board.

64. Subject to the sanction of Government, the Board may delegate to any Water Trust all or any of the right, power, and authority of the said Board to hold, use, and administer the rivers, streams, creeks, lakes, springs, and other sources of water supply situated within the boundaries of the district included within the jurisdiction of such Trust.

Powers of Trusts.

65. Subject to the sanction of the Board, every Water Trust shall have and exercise, for the purposes of this Act, all the powers given herein to the Board in sections 29, 31, 35, and 36.

Right of appeal.

66. The owners, lessees, or occupiers of land, or other persons affected by any action taken in regard to water conservation and utilization, or to drainage, or by any neglect to take action in regard to such works, shall make application for redress to the Local Trust, or, in the absence of a Trust, to the Board, and shall have a right to appeal to the Board against any decision of a Trust, and to the Minister against a decision of the Board.

Tenure of office by members.

67. In every Water Trust which consists of an even number of members, one more than half the number of members elected on the formation of the Trust shall hold office for three years, and the remaining members for two years. In any Water Trust which consists of an odd number of members, half the number obtained by adding one to the authorized number of members shall be the number which will hold office for three years, and the remainder shall hold office for two years. At the first election of members for any Water Trust the elected members shall be placed in order according to the number of votes received by each. The members who have obtained the higher number of votes shall, to the number hereinbefore described, be declared elected for three years, and the remaining members for two years; but as vacancies arise the members elected to fill them shall in all cases be elected for three years, and outgoing members may be re-elected if otherwise eligible. The members shall elect from among their number a Chairman, to preside at the meetings of the said Trust. The said Chairman shall have the same right as other members of the Trust to vote on all questions which are brought before the said Trust, and if in any case the number of votes for and against any matter before the said Trust be equal the said Chairman shall, in addition to his ordinary vote, have the right to give a casting vote. The tenure of the office of Chairman of every Water Trust shall not be for more than one year, and shall in all cases terminate in the month of December, but the members of any Water Trust may re-elect a Chairman on the expiration of his term of office.

NOTES AND EXPLANATIONS.

Water Trusts to be corporations.

63. In declaring every Water Trust to be a corporation, the precedent of the Victorian Act (No. 716) of 1881 has been followed, but in any case the necessity for this provision is evident.

Making over charge of rivers and other sources of supply to Trusts.

64 and 65. The arrangement here adopted of making over charge of the rivers, streams, lakes, and other natural sources of water supply to Water Trusts, to be held by them on behalf of Government, and under the directions of the Board, is one of primary importance. While it is an accepted rule in almost every country that all such natural sources of water supply belong to Government, it is also unfortunately a state of affairs common to several countries that the Government rights in natural sources of water supply have suffered seriously, or been altogether lost, through neglect to define and maintain them. It is a vital principle of the Act now proposed, that not only should the rights of the State be clearly set forth, but that the protection and perpetuation of those rights should be ensured. In Colorado and California the right of the State to the water supply was at one time admitted, but in both this right appears to be almost entirely lost or alienated.

Constitution and management of Trusts.

67, 68, and 69. These sections, relating to the details of the constitution and management of Trusts, require no comment.

Election of temporary Chairman.

68. In the absence of the Chairman from any meeting a majority of the members present may elect one of their number to act as Chairman for that meeting only.

Regulations regarding compensation for land.

69. The regulations herein directed for the settlement of claims for compensation where any damage is done or loss occasioned to any owner, occupier, or lessee of land or tenements of any kind, through the prosecution of surveys or other investigations by the Board, shall apply also to damage done or loss occasioned by any Water Trust in the administration of this Act.

Power of Trusts to employ engineers and others.

70. Whenever the members of any Water Trust have reason to believe that works for the conservation and utilization of water can be carried out with profit in their district they may, subject to the sanction of the Board, employ qualified engineers and surveyors and any others necessary for the preparation of the surveys, designs, and estimates for such works.

Sanction of Central Board required for all works.

71. No local Trust shall have power to carry out any works for water conservation and utilization without the sanction of the Board.

Power of Trusts to act in cases of emergency.

72. But whenever there is reason to apprehend that damage may be caused by floods before a reply could be obtained from the Board, or whenever there is an opportunity to conserve flood-water, which opportunity might be lost before a reply could be received from the Board, any Water Trust may, on its own responsibility and at its own risk, deal with the necessities of each such case as it may deem proper. In every such case the Board should without delay be informed of the case in detail, and the sanction of the said Board should without delay be applied for.

Power of Trusts to make by-laws.

73. When works for the conservation and utilization of water are administered by any Trust, such Trust shall have the power, subject to the sanction of the Board, to make by-laws for the maintenance and management under this Act of such water supply; and if any person or persons neglect or refuse to obey the said by-laws, the supply of water given to such person or persons may, after warning has been given, be stopped till the said by-laws are properly observed.

Water-rights not to be transferable, except by sanction of Trusts.

74. No person supplied with water by any Trust shall have a right to transfer such supply or any portion of it without the sanction of the Trust. In all receipts for water-rates paid to Trusts, and in all papers and documents referring to rates, a note shall be entered that the said water-rights are not transferable except with the sanction of the said Trust.

Water supplied by Trusts to be used only in manner sanctioned.

75. All supplies of water provided by local Trusts shall be delivered subject to this Act and to the by-laws; and no person shall have a right to convey or use such water in a wasteful manner different to the terms and regulations ordered in this Act, and prescribed by the said Trust with the sanction of the Board.

By-laws must be approved by the Board.

76. The by-laws proposed for the regulation of details under Trusts must in every case receive the sanction of the Board before they can be put in force.

Right-of-way for water.

77. Any Water Trust may acquire by purchase or lease a right-of-way for water through any land, whether it belong to private individuals or to corporations or to Government. If a right-of-way for a drain or distributary or channel of any kind be required by any person from any Trust, or from the Board, to enable him to obtain a supply of water, or for the purposes of drainage, the Government may, on the recommendation of the Board, resume a right-of-way for such water supply; and the rules under which compensation is regulated for any land resumed for works carried out by the Board, or by Trusts, shall apply to all water-ways and lands for the passage of water so resumed.

78. Under no circumstances shall the passage of water through the land of any owner, occupier, or lessee confer on such owner, occupier, or lessee any right or title or vested interest in such water.

Trusts not liable for failure of supply.

79. If a Trust in charge of the administration of any canal, channel, or water supply of any kind fail to furnish the established

NOTES AND EXPLANATIONS.

Powers conferred on Trusts.

70 and 71. These sections further define and limit the powers which may be delegated by the Board to Trusts.

Power of Trusts in cases of emergency.

72. The principle of this section, regarding the power of Trusts to deal, on their own responsibility and in anticipation of the sanction of the Board, with works of emergency, is borrowed from the Spanish Law of Waters, which has a corresponding clause.

Intention of by-laws.

73. It is here intended that these by-laws should include rules suitable to the Trust District in which they are in force. It is anticipated that entirely different conditions will exist in different Trusts, and the course proposed is to have a comprehensive Act which will include all, while the by-laws framed in accordance with this Act will suit each individual case.

Necessity for Government to maintain complete control over the water supply.

74 and 75. Unless the Government maintain complete control over the water supply, vested interests of a troublesome nature are certain to be acquired. It is also necessary not only that the quantity supplied to every person shall be decided by the Trust, but also that the means and method of using the supply shall be approved. On this point the practice in India, and particularly in the North-west Provinces, is very stringent, and it is the immediate result of experience derived from Southern Europe. In the case of the Lower Ganges Canal, one of the most recently constructed in India, the greatest care was taken in fixing the position of irrigation outlets; the nature of the soil, the inclination of the ground, and the general features of the neighbourhood being in every case taken into account. No outlet was allowed where the water would run through soil impregnated with salts, nor where there was likely to be much loss by percolation.

76. This rule requires no comment.

77 and 78. In connection with the distribution of water for irrigation and other purposes, one of the most important points to secure is the right to obtain a passage for water through any land between the source of supply and the place where the water is to be used: it is necessary, to guard against the chance of individual caprice or ill-will being allowed to prevent the execution of useful work. It should be remarked that it is specially provided that the Water Trusts, and not the individuals directly interested, acquire the strip of land or the right-of-way required for a channel. It is specially intended by this arrangement that the public interest and property in the water should be secure in every detail.

79. Provision is here made against liability for damages in case of failure of the supply. The Trusts are left responsible for damage done by any neglect of their members.

quantity of water, or the quantity required by the user of any watercourse or irrigation channel, the said Trust shall not be liable for any damage so arising if such failure of the supply was due to causes beyond the control of the said Trust.

Right-of-way for water across roads.

80. The right-of-way for water, as described in section 67, applies also to the right to cross public or private roads and public or private watercourses.

Bridges or culverts to be built at road-crossings.

81. Wherever it is necessary to construct a canal or channel of any kind, or to divert a supply of water across any road or watercourse, a suitable bridge or culvert or other means of crossing without hindrance to the traffic on the said road must be constructed.

Water to be sold by measure.

82. In the management of water supply every Trust shall, as far as practicable, sell the water by measurement. The appliance for or means of measurement must be approved by the Board.

Regulations for economical use of water.

83. Wherever water for irrigation is not sold by measure, the Water Trust shall have power to regulate in its by-laws the manner in which the land proposed to be irrigated shall be prepared for cultivation, and the manner in which water is used for mining and manufacturing purposes.

Power of Trusts to fix rates.

84. Subject to the sanction of the Board, every Trust shall have power to fix rates for water supplied, or on account of land benefited by drainage works. The rates for water shall ordinarily be of three kinds: first, for domestic use, and for watering and washing stock; second, for irrigation; third, for water power. In addition to these rates, Trusts may fix a rate per acre on land benefited by drainage works; and Trusts may also, when measurement of water for irrigation is not practicable, fix rates per acre for different kinds of crop grown. Also, where it is not practicable to measure water used by stock, a Trust may fix rates for every kind of stock to which water is supplied.

Regulations to be observed in fixing rates.

PART V.—Loans—how sanctioned, incurred, and repaid.

Procedure when a loan is required by a Trust.

85. Whenever the representatives of a Water Trust desire to raise money on loan for the construction of any works for water conservation or drainage, such Trust representatives shall make application to Government, through the Board, setting forth in their application full particulars regarding the nature and extent of the works proposed, and of the land to be benefited.

Inquiry previous to sanction of loan.

86. After a full inquiry regarding the statements contained in such application, the Board shall report to the Government, and shall make such recommendations respecting the said application as it may deem just.

Power of Government to grant or guarantee loans.

87. On receipt of such application and recommendation the Government may temporarily advance funds to such Trust, or it may sanction the raising of a loan by the said Trust, and may guarantee the payment of interest on such loan.

Trusts prohibited from raising loans without sanction.

88. It shall not be lawful for a Water Trust constituted under this Act to obtain money on loan from any source, or for any purpose, without previously obtaining the sanction of Government.

Security on which loans can be raised

89. Loans required by Water Trusts shall, when sanctioned, be raised on the security of the rates leviable on the lands benefited, or to be benefited, by the works carried out, or proposed to be carried out, or on the security of the lands and works belonging to such Trusts.

Purposes to which rates are to be devoted.

90. Wherever a Trust has carried out works with the aid of a loan, the rates levied by such Trust from the persons benefiting from such works shall be used as follows—that is to say:—

(*a*) For payment of interest of the loan.
(*b*) For the maintenance, repairs, and management of the said work.
(*c*) To contribute to the sinking fund.
(*d*) For the useful extension and development of the works.

80. and 81. The necessity for these clauses is obvious.

82, 83, and 84. The necessity and importance of the first and last of these clauses is evident. In the case of section 83, it may be explained that careless cultivation is one of the most fruitful sources of waste of water in irrigation. It is necessary therefore to provide some check on the manner in which the water is used. In India the land for irrigation has to be divided into rectangular plots, the areas of which are fixed by local regulations.

Notes and Explanations regarding PART V.

Sections 85, 86, and 87 conferring powers to raise loans for carrying out works for water conservation, or for drainage, are intended to ensure that loans will be sanctioned only for works which may be depended on to prove satisfactory.

Section 88 is in accordance with the Municipalities Act of this Colony, which directs (clause 190) that "no money shall be borrowed except with the sanction of the Governor." Municipalities Act of 1867.

Section 89 is almost identical with clause 29 of the "Victorian Water Conservation Act of 1883." Act 778 of Victoria 1883.

Section 90 is similar to clause 60 of the Victorian Act last quoted.

Limit to the total amount of loans.

91. When the representatives of any Trust make application for a loan, or for permission to raise a loan, and furnish to the Board the information required in this Act regarding the nature and extent of the land to be benefited, the Board shall cause an estimate to be made of the value which such land and other property will possess on the completion of the proposed works. The total amount of the liabilities of a Trust shall not be permitted to exceed two-thirds of the enhanced value thus estimated, which the land and other property benefited will possess on the completion of the works for which the loans are raised.

Change of names or boundaries of Trusts not to affect agreements.

92. If, after due consideration, and with the sanction of Government, the boundaries of any Trust District, or the name of any Trust, be altered, no bond, mortgage, or agreement entered into by such Trust previous to such alteration shall be rendered invalid, or shall be in any way affected by such alteration.

Points to be specified in applications for loans.

93. In every application to Government for a loan or for permission to raise a loan Local Trusts shall specify the rates proposed to be levied by them, the rate of interest to be paid, the amount which will annually be credited to a sinking fund, and the number of years for which the loan is required; and in no case shall the Government have power to grant or authorize a loan unless the proposals on all these points are deemed satisfactory.

Borrowing in excess of amount sanctioned —how dealt with.

94. If, in contravention of this Act, any Trust shall borrow money without the sanction of Government, or in excess of the amounts sanctioned by Government, all the members of such Trust who have consented to the borrowing of such money shall be jointly and severally liable to pay the same, together with all interest thereon, to the persons from whom the same was borrowed, and the same may be recovered from such members in any Court of competent jurisdiction, but in no case shall such money be recoverable from the Trust District; and if any appropriation of moneys belonging to the Trust be made for the purpose of liquidating any claim for money so borrowed, such members of such Trust who have consented to the misappropriation of money for that purpose shall be jointly and severally liable to refund the same and all interest thereon, and the same may be recovered from such members of such Trust, or any of them, and may be sued for by any ratepayer of the Trust District.

Separate accounts to be maintained for every loan.

95. Every Trust shall keep a separate account for every loan incurred by it, and such accounts shall at all times be accessible to the Board or to any officer deputed by the Government to inspect them; and copies or abstracts of such accounts shall be submitted to Government in such manner and at such times as Government may direct.

Misappropriation of loans.

96. Under no circumstances, except by the sanction of Government previously obtained, shall any Trust apply any portion of a loan to a purpose other than that for which the said loan was raised; and if, in contravention of this Act, any Trust misappropriates a loan or any portion of it, the members of such Trust who consent to such misappropriation of funds shall be jointly and severally responsible for the repayment of such funds, together with interest, as described in section 91.

PART VI.—Drainage Works.

Powers granted regarding water conservation to extend to drainage.

97. The powers herein conferred on the Government and on Local Trusts to enter on, survey, and resume lands, and to undertake, construct, and maintain works for the conservation and distribution of water, shall also extend to projects and works for the drainage of land.

Procedure regarding drainage works.

98. Whenever it shall appear to the Board or to a Water Trust that works for the drainage of any land are required in the interests of the public, the said Board or the members of the Water Trust within whose district such land is situated may, with the sanction of Government, proceed to make investigations and to prepare surveys, designs, and estimates for such works, in the manner herein described in

NOTES AND EXPLANATIONS.

Section 91 contains an important principle regarding the manner in which the maximum amount which a Trust may be allowed to borrow should be estimated. There are cases in which works for water conservation would raise the value of land tenfold, and it would clearly be short-sighted in such cases to estimate the borrowing powers of a Trust on the basis of present value. The justice of the principle of fixing the maximum borrowing powers of local bodies according to the enhanced value anticipated as a result of proposed works has already been recognized by the Crown Law Officers of this Colony.

Section 92 is based on provisions made in the most recent amendment of the Victorian Water Conservation Act for the effect of changes of names of Trusts. Act 829 of 1884—Victoria

Section 93 is intended to indicate the points connected with the financial prospects of any project which a Trust will be required to prove satisfactory before a loan can be sanctioned.

Section 94 is almost identical with clause 57 of the Victorian Water Conservation Act of 1883, and its importance is obvious. Act 778 of 1883—Victoria.

Sections 95 and 96 are based on clause 54 of the Act last quoted.

Notes and Explanations on PART VI.

Sections 97 and 98 are intended to confer the same powers in regard to drainage works as those already conferred in regard to works for water conservation.

connection with works for water conservation. The Board or the said Water Trust may also construct such works, and for this purpose may levy rates and raise loans.

Project to be submitted to the Central Board.

99. Before a Trust can be permitted to carry out any drainage work, a statement must be furnished to the Board showing the nature and extent of the land which will be benefited by the proposed works, and setting forth clearly the value of such land and the extent to which it will be benefited. This statement of the anticipated results of the proposed works, together with the plans and estimates, must be approved by the Board before such works can be sanctioned.

Assessment of rates.

100. In assessing rates on lands benefited by drainage works the members of Water Trusts shall be guided by the proportionate extent of the increase in value due to such works.

Combined drainage and water conservation works.

101. Wherever drainage works are constructed by the Board, or by a Water Trust, the drainage water thus made available shall, as far as practicable, be conserved and utilized; and no designs for drainage works shall be sanctioned unless the conservation of the drainage water is considered fully, and as far as practicable provided for.

Assessment on combined works.

102. When drainage and water conservation are provided for in the same project the rates for such works shall be assessed both on the lands drained and on the lands benefited by the water supply so provided.

Works aided by loans to be subject to Government sanction.

103. Drainage works proposed to be carried out with the aid of loans must be first sanctioned by Government, and must be subject to Government inspection and approval.

Projects for water conservation to be considered in relation to their effect on drainage.

104. When any project for irrigation works, or for works for water conservation, is submitted to the Board by a Local Trust, the Board shall consider such project in relation to its bearing on drainage; and if it shall appear to the Board that such project should, either on sanitary grounds or to prevent injurious effects to the land, include provisions for a system of drainage, the Board shall require that such provision shall be made in the design and estimate for the proposed works.

Tail water from mines and manufactories.

105. When the use of a supply of water for mining or manufacturing purposes is granted by any Trust, such use shall in all cases be subject to the provisions of this Act in regard to waste or to use in a negligent manner; and every person using a supply of water for mining or manufacturing purposes shall be required to make such arrangements as will render such supply of water available for further uses as far as it is practicable to do so.

PART VII.—Navigation.

Trusts to regulate navigation within their own districts.

106. When the whole or any portion of a navigable river is situated within the bounds of a Trust District the Government may, on the recommendation of the Board, delegate to such Trust the authority to regulate the navigation within such district.

Authority of Trusts to carry out projects or works for navigation.

107. In pursuance of this authority, any such Trust may make surveys, designs, and estimates for works connected with the improvement of navigation, and may for such purposes exercise the same power and authority as herein authorized for projects or works for water conservation.

Navigation to be provided for as far as advantageous.

108. In all cases where works for water conservation and supply interfere, or are likely to interfere, with the level or flow of water in any river, the requirements of navigation may be provided for, so far as this can be done, without detriment to the interests of water supply and irrigation.

Regulations for preparing navigation projects to be similar to those for water conservation.

109. The regulations hereinbefore ordered for the preparation of projects and for the carrying out of works connected with water conservation and supply shall, so far as they are applicable, extend to projects and works connected with navigation.

Power of Trusts to levy navigation rates.

110. Subject to the sanction of Government, and for the maintenance or improvement of any river or other navigable channel, any local Trust constituted under this Act may levy rates from any person using such river or channel for the purpose of navigation.

NOTES AND EXPLANATIONS.

Sections 99 and 100 involve precisely the same principles as have already been provided for in the case of water conservation.

Sections 101, 102, and 104 are intended to meet a well-known objection to irrigation. Most opponents of irrigation, and even some of its advocates, lay down the rule that no irrigation works should be undertaken without provision being at the same time made for drainage. If this system were strictly carried out, there would be few irrigation works attempted. While it may safely be stated that, as a general rule in this Colony, irrigation works will not involve a necessity for systems of drainage, still it is necessary to provide against the possible evil effects of injudicious irrigation. Another important point for which these sections are intended to provide is that the drainage of some of the great swamps which form evaporation pans in which valuable supplies of water are lost should be carried out in such a manner as to render these supplies available for use. It is hoped and expected that works of this nature will, so far as drainage is concerned, be the most important which Local Trusts will undertake.

Section 103 applies to drainage works a rule already laid down in connection with works for water conservation.

Section 105 is one of great importance, and is intended to provide against evils such as have arisen in California through the unregulated use of water for hydraulic sluicing. Under this section Local Trusts will also have the power to regulate the disposal of impure water escaping from manufactories.

Notes and Explanations on PART VII.

India—Act VIII of 1873.

Absence of guiding enactments.

For reference, in the preparation of this portion of the Bill, almost the only available information of a useful description was that contained under the heading of "Canal Navigation" in the "Northern India Canal and Drainage Act." Even this authority could be adopted to only a very limited extent, the circumstances of the country being entirely different to those of India, and the proposed administrative machinery being still more widely different. Hence, in framing this portion of the proposed Bill, it was necessary, in the absence of guiding enactments, to consider the various questions most likely to arise in the management and development of navigation, and to meet the requirements of every case by suitable regulations. While the attainment of this object has been held in view, it follows, from the circumstances of the case, that authorities cannot be quoted in support of the enactments proposed.

Power to detain a vessel till rates are paid.

111. Any Trust possessing jurisdiction over any navigable river or channel shall have power to detain any vessel, boat, raft, or other floating body, till the authorized navigation rate on such vessel, boat, raft, or other floating body, together with the expense of such detention, has been paid.

Sanction required before levying rates.

112. Before rates for navigation can be levied or altered by any Trust the sanction of Government must be obtained.

Trusts not responsible for failure of supply.

113. No Trust shall be held responsible for any damage which may be caused through failure of the supply of water in any river or navigable channel.

Power to raise loans for navigation.

114. Loans for the improvement of navigation may be raised under the same restrictions and subject to the same conditions as are hereinbefore described for works for drainage and water conservation.

Conference of Trusts on matters of common interest.

115. When the whole length of a navigable river or channel is not within the jurisdiction of one Trust, the members of every Trust through whose district such river or channel passes shall have the power to appoint one or more of their number as a deputation to confer with a similar deputation from every other such Trust. At such conference a combined system of management of such river or channel may be arranged, and other matters of common interest to such Trusts may be settled; but all such arrangements and settlements must be ratified at a meeting of every such Trust, and must receive the sanction of the Board before such arrangements or settlements can be acted upon.

PART VIII.—Offences and Penalties.

116. Whoever, without proper authority, and voluntarily does any of the following acts, that is to say:—

Obstructing Government or Trust Officers.

(*a*) Obstructs, in any way, any person in the employment of a local Trust, or of Government, or of the Board, when such person is acting under the authority of the said Trust, or of the Government, or of the Board:

Interfering with marks.

(*b*) Removes, injures, or in any way interferes with any pegs, bench-marks, or other marks, or objects for reference, placed in the execution of his duty by any person employed in pursuance of this Act, in making surveys, levels, or other investigations in connection with any work or project for water conservation or for drainage:

Depositing material on land belonging to Government or to a Trust.

(*c*) Deposits material or refuse of any kind within the bounds of any land resumed or otherwise acquired for any work of water conservation or drainage:

Polluting water.

(*d*) Pollutes, or renders less useful the water standing or flowing in any river or drainage work or work for water conservation:

(*e*) Interferes with the supply or flow of water in any river, creek, stream, or lake managed by a Trust, or causes injury to fences, works, land, or any other property held or managed by a Trust:

Penalty.

shall for every such offence be liable, on conviction before a Magistrate, to a penalty not exceeding twenty pounds, or to imprisonment for a term not exceeding three months; and every such offender shall be liable to a further penalty of ten pounds for every day during which such offence is continued after such person has received notice, in writing, to discontinue the same.

Wilful injury to works.

117. Any person who wilfully damages or obstructs any work for water conservation or for drainage, and any person who, without proper authority, interferes with the supply or flow of water in or from any work constructed or maintained under the provisions of this Act, shall for every such offence be liable, on conviction, to imprisonment for a period not exceeding three years or to a fine not exceeding five hundred pounds, or to fine and imprisonment combined within the limits here ordained.

Waste of water.

118. Any person who being responsible for the proper use and management of a supply of water, subject to the provisions of this Act, neglects to take proper precautions for the prevention of waste of the

NOTES AND EXPLANATIONS.

Notes and Explanations on PART VIII.

Section 116 is framed on the model of Part X of the Northern India Canal and Drainage Act, but departs from it in some important particulars. In the Victorian Water Conservation Act of 1881 the penalty for letting foul water into any stream or reservoir belonging to a Waterworks Trust is limited to five pounds and a further penalty of twenty shillings for every day on which the offence is continued. In the New Zealand Counties Act Amendment Act of 1883 the corresponding penalties, for the same offence, are one hundred pounds and ten pounds per day. The penalty now proposed lies between these, and appears adequate to meet such offences.

India—Act VIII of 1873.
Victoria—Act 716 of 1881.
New Zealand—Act 36 of 1883.

Section 117 deals with a much more serious offence than the foregoing, namely, that of wilful damage to works. In the Victorian Act, above mentioned, this offence is classed as "a felony" and the maximum punishment is imprisonment for ten years. In the New Zealand Act, quoted above, this offence is termed "a misdemeanour" and the offender is declared liable to imprisonment for three years or to a fine of five hundred pounds, in addition to paying the cost of repairing the damage done.

Victoria—Act 716 of 1881.
New Zealand—Act 36 of 1883.

Section 118 is based on the Spanish Law of Waters and the Northern India Canal and Drainage Act. The principle has already been dealt with under Part II.

Spanish Law of Waters.
India—Act VIII of 1873.

water thereof, or interferes with the authorized distribution therefrom, or uses such water in an unauthorized manner, shall for every such offence be liable to a penalty not exceeding ten pounds or to imprisonment for a term not exceeding one month.

119. The penalties directed under last section for the wilful or negligent waste of water shall apply to the water-rights acquired under the "Mining Act of 1874" or under any other Act or regulation in force previous to the passing of this Act.

Compensation to injured parties.

120. Whenever any person is fined under this Act the Magistrate may direct that the whole or any part of such fine may be paid by way of compensation to the person injured by such offence.

Offenders liable to pay compensation as well as penalty.

121. Any person offending against this Act may be sued for compensation on account of the damage incurred or sustained through his offence; and this liability for the loss and damage caused will not in any way mitigate or affect the concurrent liability to punishment for the said offence under the terms of this Act.

Offenders liable to punishment under other Acts.

122. Nothing herein contained shall prevent any person from being prosecuted under any other law for any offence punishable under this Act: Provided that no person shall be punished twice for the same offence.

Careless navigation.

123. Whoever causes any vessel, boat, raft, or other floating body to enter or navigate any river or other channel contrary to the rules and regulations for the time being which have been sanctioned by the Government, and whoever while using a river or other channel for the purposes of navigation neglects to take proper precautions for the safety of such river or channel, or of his vessels, boats, rafts, or other floating bodies, shall for every such offence be liable to a penalty of twenty pounds or to imprisonment for one month, and shall in addition be liable for the value of the damage caused by every such offence.

Section 119 is based on the principle enunciated in Part II, that no one has a right to waste water obtained by him from any public river, lake, or other source, whether natural or artificial. This principle is acted on in India, and also in Italy and Spain; and certainly none of those countries calls so much for stringent regulations regarding the waste of water as this Colony does.

Section 120 is adopted from the Indian Canal Act. India—Act VIII of 187 .

Section 121 is in accordance with the general practice of legislation on such points, and is identical in principle with section 93 of the Victorian Water Conservation Act of 1881. Victoria—Act 716 of 1881.

Section 122 is adopted from the Indian Canal Act. India—Act VIII of 1873.

Section 123 is also based on the Indian Canal Act. India—Act VIII of 1873.

(12.) CONCLUSIONS AND RECOMMENDATIONS.

Legislation and Riparian Rights.

While the Draft Bill already given embodies in detail the principles which, in our opinion, legislation should include, and on which it should be based, the following may be taken as a brief summary of our opinions on this most important branch of the question.

State ownership.

We are of opinion that the most simple, and at the same time perfectly equitable plan to get rid of the mysterious complications of the common law, so far as riparian rights are concerned, is for the Legislature to establish the ownership of the State over all rivers and watercourses, giving to the owner of the land the right to conserve the rain which falls upon it, but not the right to intercept the water of streams or springs which naturally flow through it except by legal sanction. The 30th Article of the Spanish Law of Waters enacts that there belongs to the owner of an estate the rain-water which falls or is collected on it while passing through it. He may in consequence construct within his own property cisterns, tanks, ponds, or reservoirs to preserve it, always providing he does not injure the public or third parties.

Works to be carried out by Local Boards.

Although we attach the greatest importance to ownership by the State of all rivers, water-courses, and lakes, we do not think that, as a general rule, it would be wise that the Government should itself undertake the works which would be necessary to supply the country with water. Having obtained full and indubitable power to carry out all works which may be necessary, and to dispose of the water as may be deemed expedient, we think that the State ought to delegate its powers (with certain limitations) both as to construction and management of works to those whose interests are immediately concerned.

The right to construct overshot dams.

The question of the right to construct overshot dams in creeks and rivers is one which has given rise to litigation, and which is still in a very unsatisfactory state. Owners or occupiers of land adjoining creeks and rivers have, as the law now stands, no right to obstruct the flow of running water, or to erect a dam of any kind. The natural consequence of this state of affairs is that both pastoral and farming interests have been seriously interfered with. The opinion at which we have arrived is, that the privilege of erecting dams, as well as the limits of their heights, and the general nature of their design, can be best decided by local Trusts, composed of persons interested in the creeks or rivers in which such dams are proposed to be constructed. In the draft of the proposed Bill we have, therefore, given ample powers to Trusts to deal with all such questions. In the absence of a local Trust the regulation of the heights of dams, as well as the decision of all other questions relating to water conservation and supply, will rest with the Board which we propose.

Schemes to be controlled by elective bodies.

Inasmuch as the expenditure upon water supply within any particular district must be mainly borne by the land-owners within that district, we are of opinion that the initiation and control of schemes necessary to accomplish the end in view should as far as practicable be vested in bodies to be elected by those who would have to pay the rates and who would reap the benefits. These representative bodies might be the members of local governing Boards, or they might be distinct and separate Water Trusts, such as exist in Victoria, and as described in our Secretary's Report, appended. It is obvious that the residents of a district are better able to judge of their own requirements than any governmental or official authority at a distance, and, so long as care is taken that they shall pay a large proportion of the cost of what they require, they will themselves apply the most effective checks upon neglect, extravagance, and incompetence.

Appointment of Permanent Board.

For the general management of the water supply of the Colony, and the supervision of its administration by Local Trusts, we believe that a permanent Board should be appointed, and that this Board should have power to deal with the construction or management of necessary works in cases which are beyond the capabilities of Local Trusts.

Department under a Minister for Water Supply.

In order that the interests of water conservation and supply may receive in Parliament the attention which they deserve, we are of opinion that a separate Department, under a responsible Minister for Water Supply, should be established.

While

Professional Staff.

While we do not think that it would, except in the case of head or other extensive works, be expedient for the Government to undertake the construction of works for water supply to rural districts, still we are of opinion that it would be absolutely necessary that Government should maintain a small staff of highly skilled engineers, who would be competent to advise them upon the merits of any scheme proposed by the residents of a locality in connection with their application for a loan; and, in the event of the scheme being approved, to periodically inspect and report upon all important works while being carried out under the supervision of the engineer employed by the Local Board or Water Trust, as the case might be. It is important that the Government should have such advice, for several reasons, but principally because without it they would not have the information which would enable them to decide equitably upon conflicting applications, or to ensure that the water available for the supply of a certain area of country was not monopolized by the residents in a particular portion of it; they would not be able to deal satisfactorily with the claims and interests of conterminous Trusts drawing their supply from the same source; they would not have an assurance that, as acting for the whole country in authorizing the allotment of portion of a loan and Parliamentary grant, the works proposed were sufficiently stable and valuable to the general community to justify the expenditure, nor would the particular district more immediately interested have so good a guarantee of the soundness of the scheme propounded by their own engineer as they would have after that scheme had been checked and indorsed by independent and perhaps more highly skilled engineers.

Finance.

We advise that legislation authorizing the making of loans by the Government to Trusts should provide—

(1.) For the taking of a mortgage over the works and revenues of the Trust to whom the loan was granted.

(2.) For the levying by the Trust of a rate sufficient to pay, as a first charge, (*a*) the interest stipulated in the mortgage; (*b*) sinking fund, say at the rate of $1\frac{1}{2}$ per cent. per annum, for the liquidation of the principal sum; and (*c*) for the maintenance of the works in a good state of repair.

(3.) For the Government being required to levy and collect such rate in the event of failure, from any cause, of the Trust to do so.

(4.) For an annual audit of the accounts of the Trusts, so long as they remained in the position of debtors to the State.

Loan for Water Trusts.

The Government of Victoria initiated their system in 1881 by raising a loan of £400,000, which amount has been lent at $4\frac{1}{2}$ per cent. to different Water Trusts upon the security of their works and revenues, in sums proportionate to the character of the works to be constructed, and Parliament appropriated a further sum of £100,000 as a free grant to the Trusts. The allotment of this subsidy is dependent upon the magnitude of the works undertaken by the Trusts, and is intended to act as an incentive to localities to enter upon water schemes. The area of New South Wales being larger, its population sparser, and the extent of unalienated land being greater than it is in Victoria, afford reasons why the amount of the Parliamentary grant should be larger than that of the sister Colony. The loan would be for the construction of specific works to confer a direct pecuniary benefit upon those who undertake them, and not of the continuing, fluctuating, and general character of municipal expenditure; hence a grant in aid seems to be better adapted to meet the requirements of the case than would an annual endowment.

Publicity.

Provision should be made for the utmost publicity being given to all applications for the formation of Water Trusts and for loans to carry out works, and they should be dealt with by the Government only after opportunity had been given to all persons or communities whose interests might be affected to state their objections, in the same way as has always been customary at the inception of new municipalities. In fact, presuming the Water Trust to be a body distinct from the local governing body, all the machinery under which they would act might be almost identical with that established under a Local Government Bill, *e.g.*, the municipal valuation might be used for assessing rates on property.

Head-works.

It may be found that two or more districts would derive their supply from the same source, and that the head-works necessary to provide it would be beyond the means of any, and perhaps of all, to accomplish. In view of this by no means improbable

Union of Trusts.

improbable contingency we suggest that power should be given for the union of one or more Trusts; and it might perhaps even be expedient that the Government should construct the head-works required, where these are of exceptional magnitude and difficulty, and to apportion the rate of contribution by each Trust using the water according to the extent to which it would be benefited.

Urban and Irrigation Trusts.

It would be desirable and necessary that provision should be made for the subdivision of any Trust area, so as to allow an urban population devising and carrying out a scheme of water supply as a separate Trust, or of a community of farmers forming themselves into an irrigation Trust. The requirements of such classes as these are distinct from those of a rural population, and it is obviously just that those who need a special service should pay for the benefits which they exclusively receive, or are capable of receiving. With regard to town supplies, the Engineer-in-Chief for Harbours and Rivers, says (Q. 1117):—"I think it would be a very good thing if the Government were relieved of a great deal of the work now thrown upon them. I think, for instance, that the water supply to country towns ought to be carried out by the local municipalities, and that the Government should be relieved of the duty of carrying them out."

Irrigation.

While the evidence which we have obtained on the subject of irrigation is contradictory, as might be expected from the very limited experience in this Colony of the expense and effects of irrigation, still we have carried our investigations so far as to enable us to arrive at the following important conclusions:—

(1.) That on the alluvial plains extending along the courses of the rivers west of the Dividing Range irrigation of crops can be profitably carried out by pumping.

(2.) That flood-water can under favourable circumstances be profitably used for the irrigation of the natural grasses.

(3.) That the soil throughout the Western plains is, as a rule, eminently suited for raising crops by irrigation.

(4.) That as evidence has been given of large purchases of hay by pastoralists during past years, it is evident that irrigation would increase settlement on the land by making farming on a moderate scale remunerative.

(5.) That by the irrigation of comparatively insignificant areas of lucerne or other crops for hay or ensilage the preservation of stock throughout periods of drought can be ensured.

(6.) That under average circumstances the irrigation of 100 acres of lucerne for every 20,000 acres of pastoral land would afford complete protection against drought.

(7.) That owing to the small available supply, the general dryness of the climate, the absorbent nature of the soil, and the long distances which water will in many cases require to be conveyed, great attention should be given to the economical distribution of the water; and for this purpose we trust that it will be found practicable to make extensive use of pipes, whether of iron or of earthenware, or of some such composition as asbestine.

Agriculture.

Destruction of forests to be under control.

Irrespective of their commercial value, forests render important service in reducing the temperature in their neighbourhood, in moderating hot winds, in increasing the humidity of the atmosphere, in protecting the soil from erosion, and in diminishing the rate of evaporation from the surface of the land or water near them, and we therefore think that the destruction of forests should be under strict and judicious control.

Agricultural irrigation farms.

Agricultural farms established by Government in a locality having command of water for irrigation would probably be very valuable, not only as a means of educating youth in practical and scientific husbandry, but also as affording an example to the agricultural community of the advantages which wet cultivation possesses over every other description of farming. The experience which would soon be

be accumulated with respect to the returns from various kinds of crops under irrigation as compared with ordinary dry tillage would be of very great value.

Drainage Areas.

Coast River Basins.—Although we have taken no evidence regarding the coast districts, the papers placed at our disposal convince us that the question of irrigation in some at least of the coast river basins has up till the present remained in abeyance, simply because the farmers and fruit-growers did not fully understand the benefits which irrigation would confer, and which are so well illustrated in results obtained in the coast districts of Southern California. The best methods for the improvement of the productive capabilities of the coast districts should in our opinion be fully inquired into, and means should be taken, either by lectures in connection with the Board of Technical Education, or otherwise, to make known as widely as possible the importance of irrigation as an aid to production.

Basin of the Snowy River.—The evidence we have obtained tends to show that, in the volume and regularity of its discharge, the Snowy River is one of the most important rivers in the Colony. We are of opinion that it would be a great advantage to this Colony if a portion of the waters of the Snowy River were diverted into the Murrumbidgee, and we have initiated the investigation of the practicability of such a project, but are not yet in a position to come to a decision regarding it. This Colony occupies the same relative position in regard to the upper portion of the Snowy River as the Colony of Victoria holds in regard to the Mitta Mitta, Goulburn, and other tributaries of the Murray.

Basins of the Billabong Creek and Murray and Murrumbidgee.—The compilation of levels made by our instructions have shown clearly that, in the plains between the Murray and the Murrumbidgee, the country slopes from the Murray towards the north-west, and from the Murrumbidgee towards the south-west. This conformation of the country is so favourable for the diversion of supplies from these rivers that the question should in our opinion be dealt with in detail as soon as possible. The discharges of the Murray and the Murrumbidgee should be measured twice every year—once while the snow-water is flowing, and once while the rivers are low. We are of opinion that the creeks and ana-branches should be utilized as far as possible as distributaries, and in our opinion the practicability of such work is so assured as to warrant the commencement of surveys without delay. Being convinced that in addition to the intermittent canals suggested above, permanent canals can be constructed and supplied from the Murray and the Murrumbidgee, we recommend that the surveys required to determine the financial practicability of such canals should be undertaken. The storing of water near the heads of the basins of the Murray and Murrumbidgee, and the diversion of a supply from the Upper Murray, are questions which have come under our attention. We have not yet been able to complete our inquiries regarding them.

Drainage Areas of the Mirool and other Creeks, Basin of the Lachlan and Manara County Drainage Areas.—We recommend that, with a view to conserving and utilizing the flood-water of the Lachlan, that river should be carefully surveyed and levelled. All rocky bars should be noted, and the general character of the bed and banks of the river should be recorded. Surveys should be made and levels taken along the courses of the Booberoy, Willandra, and Merrowie Creeks, on the north side of the Lachlan, and of the Island and other Creeks on the south side. The survey should, in the first instance, include the Lachlan from Cowra to the junction with the Murrumbidgee.

Basin of the Darling and its Tributaries, the Bogan, Macquarie, Castlereagh, Namoi, and Peel.—Water conservation is a work of vital importance for the development of the whole Darling Basin, so that the practical question to decide is in regard to the places where such works are most urgently required. We are of opinion that the Gwydir is the first affluent of the Darling which calls for Government interference. That river should be surveyed and levels should be taken along its course, and thence by the Darling to Walgett. The Great Ana-branch should be included in this survey, the object of which would be to determine the best method of utilizing the flood-waters, and of satisfying the requirements of the riparian proprietors. Next after the Gwydir, the Namoi and the Macquarie require to be similarly surveyed and examined.

Yantara

Yantara County and Tara County Drainage Areas.—In the west and north-west of the Colony, the work being done by the Roads and Bridges Department, in providing supplies of water for travelling stock, is a most important and necessary step towards a system of water conservation. More than is being thus done we think the circumstances of the country would not at present warrant. The necessity for water conservation for the development both of the mineral and pastoral capabilities of the western districts is undisputed. The information at our disposal is, however, insufficient to enable us to form a decided opinion, but we believe that the further development of the underground water-supply is the first step necessary.

SUMMARY OF LEVELS AND SURVEYS NOW CALLING FOR ATTENTION.

Examination of drainage basins.

The Government, by advising the appointment of this Commission of Inquiry, has recognized that the welfare of the community and the further progress of the Colony depend in large measure upon the establishment of a right system for the conservation of water; and by virtue of the State ownership of the land still unalienated it has a direct pecuniary interest in the settlement of the people upon the public estate. Both these considerations lead us to recommend that an examination of the country should be made with as little delay as possible, by engineers competent to advise the Government as to what schemes are practicable (having regard to the population, resources, and requirements of the district), and most advisable for supplying water within the area of each drainage system. They should be instructed to discover if there exist any natural depressions which are capable of being converted into large reservoirs for the storage of water; and, in defining the course of distributing channels throughout any given area, they should, as far as possible, follow the higher levels of the country, so as to give the greatest facilities for irrigation. It should be quite possible for a small staff of engineers, acting in concert with the district surveyors, to indicate within twelve months the most important works necessary to be carried out in the Colony. It is important that the Government should have accurate information as to the nature and extent of the water supply which could be made available; and until this is obtained no useful scheme can be entered upon. The publication of schemes devised by these engineers would show the residents in the particular districts concerned the means by which they could supply themselves with water; and it may be expected that the projects devised by them will form the basis of schemes which the people will themselves seek to carry out.

From the examination of the levels of the Colony and the gauging of the rivers the following recommendations are warranted—

(1.) That as the entire country or doab between the Murray and the Murrumbidgee possesses remarkable facilities for irrigation, both from permanent and from inundation canals, a complete series of cross-sections should be made from river to river, and an estimate prepared for distributing the whole available supply of water on a comprehensive system.

(2.) That the practicability of storing water on the Upper Murrumbidgee and of conducting a supply from the Snowy River to the Murrumbidgee, should be determined by surveys and levels.

(3.) That the practicability of diverting water from the Tooma River or the Upper Murray into the Billabong, and also of storing supplies in the Upper Murray, should also be determined.

(4.) That the adaptability of Lake George and the principal lakes of the Colony as storage reservoirs for flood-water should be investigated.

(5.) That such cross-sections of the country or doab between the Macquarie and the Bogan should be made as will show the lines along which flood-water from the Macquarie can be most usefully diverted, and that traverse surveys and longitudinal sections of the Macquarie and Gwydir Rivers should be made.

(6.) That where the Harbours and Rivers Department has not already done so, longitudinal sections of the Murray, Murrumbidgee, Lachlan, and Darling, beginning from Tintaldra, Gundagai, Cowra, and Walgett, respectively, should be made, and that when taking such sections, particulars as to heads of creeks and ana-branches should be noted.

The

The existence and direction of subterranean supplies and currents can only be determined scientifically, and to full advantage for the benefit of the country, by a compilation of special hydrological and geological maps, which we recommend should be commenced without delay.

Expression of thanks.

We desire to express our grateful sense of the promptitude and courtesy with which our applications for information have been replied to by the Secretary of State for the Colonies, the Governments of various European States, the Government of India, the Governors of the States of California and Colorado, the Royal Commission on Water Supply for Victoria, the Departments of Water Supply of Melbourne and Adelaide, the Campbelltown Water Trust, Tasmania, the Government of Queensland, and the Heads of Public Departments in Sydney.

Appendices.

We attach hereto Appendices, as follows :—

Report on canals and irrigation in India, by Mr. F. A. Franklin, C.E.
Report on river-gauges, showing list of present and proposed sites, by Mr. H. G. M'Kinney, M.E., M.I.C.E., the Engineer to the Commission.
Report on railway and other levels in the interior of the Colony, by the Engineer to the Commission.
Further report on levels, by the Engineer to the Commission.
Report on the Tantangara Basin, Upper Murrumbidgee, by Mr. Cornelius Haylock, L.S.
Report on Mr. C. Haylock's survey of the Tantangara Basin, by the Engineer to the Commission.
Report on the River Murrumbidgee as a source for canals, by the Engineer to the Commission.
Report on the River Murray as a source of supply for canals, by the Engineer to the Commission.
Report on the Namoi River, *with plan*, by Mr. F. B. Gipps, C.E.
Report on conservation of water in Victoria, by the Secretary.
Report on the Barwon River, and Tarrion and Cato Creeks, by the Engineer to the Commission.
Report on the Macquarie River and the district between the Macquarie and Bogan Rivers, by the Engineer to the Commission.
Report on the Upper Murray Valley, by Mr. F. B. Gipps, C.E.

Minutes of Evidence taken.
Sketch map of the north-eastern portion of the Western Division of New South Wales.
Colony map of New South Wales, showing drainage areas and levels.
Diagrams illustrating the rainfall, temperature, and evaporation in the Colony.

The maps, plans, and diagrams will be found in the accompanying portfolio.

We have the honor to be,
Your Excellency's most obedient servants,

(Signed) WILLIAM JOHN LYNE, *President.*
RUSS. BARTON,
JOHN B. DONKIN,
F. A. FRANKLIN, C.E.,
R. L. MURRAY,
D. McMORDIE, B.E., M. Inst. C.E.,
GEO. W. TOWNSEND,
WALTER S. TARGETT. } *Members.*

I concur in the above Report generally, but dissent from recommendations with regard to Administration and Drainage Areas.

(Signed) FRED. B. GIPPS.

APPENDIX.

REPORT ON CANALS AND IRRIGATION IN INDIA.

To The Colonial Secretary.

Sir, Sydney, 30 July, 1884.

I have the honor to furnish you with a report on the Ganges, Jumna, and Sone system of canals and irrigation in India.

In accordance with your instructions, conveyed to me by telegram on the 8th February last to examine into the system of water conservancy of Bengal and Upper India, I took the earliest opportunity, on the completion of my work in connection with the Calcutta Exhibition, to proceed first to Arrah, the central district of the Sone circle of canals. At that place arrangements had been made by Colonel J. M. Heywood, R.E., Superintending Engineer, to proceed with me to Dehree, the head works of the system. The whole of the works were minutely described, and the practical working of shutters, sluices, and regulators illustrated by G. Shawe, Esq., C.E., Executive Engineer of the district. Upon completion of the inspection of the highly interesting system of the district, the next work visited was the terminal point of the Ganges Canal at Cawnpore. From thence I proceeded to Agra, and examined the escape of the Delhi Canal at that place. I afterwards went on to Delhi to make myself acquainted with the head works on the river Jumna, at Okla, 10 miles below that city.

On completing my inquiries at Delhi I went on to Roorkee, and thence to Hurdwar, the head works of the Ganges Canal, 20 miles above the town of Roorkee. Being provided at this place with an elephant, and accompanied by the resident engineer, I was enabled to inspect the mode of training the Ganges towards the off-take of the canal. When returning to Calcutta I branched off by the Oudh and Rohilcund Railway to Rajghat, and visited the head works of the Lower Ganges system.

The Upper Ganges Canal.

This project was first conceived by Colonel Colvin, R.E., in 1836, but nothing of a practical nature was done until the great famine of 1837–38 forced the question on the serious attention of the Government. Colonel Cautley having succeeded Colonel Colvin, who was very sanguine of the success of the scheme, strongly urged his successor to continue the examination. In 1848 the work was commenced with great vigour.

The head works of this great canal are situated at the sacred town of Hurdwar, within sight of the snow-capped peaks of the Himalayas. The source of the great river is at Gungotri. A little above Hurdwar the Ganges throws off a branch about 250 feet broad, which is used as the supply channel for the canal. The quantity of water taken off is regulated by sluices, and the remainder is allowed to rejoin the main river lower down. The bed of this branch has been deepened to an uniform slope of 8½ feet per mile, and the erosion of the banks is prevented by spurs or bunds placed transversely with the axis of the stream. The general bed of the Ganges above this point is but ill defined, and the current liable to constant change. Therefore, in order to obtain a regular supply, the head of one of the main channels is closed by a temporary dam, composed of timber cribs filled with boulders, and built up to flood level, which can be removed when threatened by more than ordinary flood. The other channels are closed by temporary bunds of moderate height, so that the supply channel to the canal is under complete control. Just above the entrance to the canal a permanent bar has been constructed as an escape (communicating with the main river), and to regulate the cold weather level.

The entrance to the canal is at Myapoor, and then commences a complete series of works of a most extensive character. They consist of a masonry dam some 600 feet in length (in course of reconstruction at the time of my visit) across the Pyree branch. This dam is provided with sluices, and across the entrance to the canal is a masonry bridge of ten arches, each 20 feet wide, fitted with shutters or gates for regulating the admission of the water as may be required for navigation or cultivation.

Between the Myapoor headworks and the high land on which Roorkee is situated, the canal traverses a line which bisects several mountain streams. On this portion of country the most formidable obstacles to the project were met with. The tract of country referred to is triangular in shape, the northern side being formed by the Sewalik hills, the eastern by the river Ganges, and the western by the high land which constitutes the boundary of the valley of the Ganges. Along the direction of a rapid slope the line of canal is carried, and the drainage of three mountain streams which cross the canal at right angles is provided for by works which will be hereafter described.

The canal is 140 feet wide at the bottom, has a slope of 1½ to 1, and the water is 10 feet deep. It is constructed with a fall of 15 inches in every mile, but this is much less than the natural fall of the country; the excess of slope is therefore provided for by artificial works. To this end masonry falls are formed between Hurdwar and Roorkee. To regulate the slope of the channel from Hurdwar to Roorkee there are four such falls of 9 feet each. The navigable canals which form loops round these falls are furnished with locks, compensating the fall in the main canal. The total fall of 36 feet delivers the water at Mahewar, 27½ feet above the level of the Solani River valley, within a mile of Roorkee. The first mountain-stream or rao is the Puttree, conveyed over the canal by superpassage, which merely acts as a watercourse during floods, and at other times may be used for the purposes of cross-communication. The work is of a very massive character, with strong parapet walls. The catchment area of this torrent is about 80 square miles, having a width of 5 miles, and an average length of 16 miles, commencing at the Sewalik range of hills and terminating at the superpassage. The superpassage consists of eight arches, of 25 feet span each, which discharge the canal supply. The fall of 9 feet takes place above each arch, and the ninth arch provides for navigation, the lock-gate being attached to the bridge. The water-way over the superpassage is 300 feet in the clear, the parapets being 14 feet high. The Ranipore superpassage is in most respects similar to the above, except that its water-way is only 200 feet wide in the clear.

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The next work of magnitude is at Dhunowree, at the intersection of the Rutmoo Rao or River, which it meets and crosses on the level of the canal-bed. The works designed for the passage of this river across the canal consists of a masonry apron on the right and a regular escape dam on the left bank, provided with forty-seven sluice-gates 10 feet wide, with sills flush with canal, and connected by revetment walls, with a traffic-bridge on the up-stream side of the canal, and a regulating bridge on the down side. In addition to the sluices just referred to, there are on each flank five other sluices, with sills raised 6 feet, and on the extreme flanks are platforms or weirs at the permanent or maximum level of the canal, so that in extreme floods an escape across the canal is provided for a width of 800 feet. The whole of the escape sluices can be opened very quickly by a very simple contrivance, the chains holding the gates being released by a slight tap with a hammer.

The regulating bridge is composed of ten arched spans of 20 feet each in the clear, with necessary apparatus for raising and lowering. By these means an immoderate storm discharge is completely under control. On the occurrence of a flood the dam sluices are opened and the regulating gates of the canal bridge closed, so that the excess water is conveyed away harmlessly to the natural bed of the river, the middle sluice gates allowing the escape of silts to the level of canal bed. On the termination of a flood the canal regulator is again opened, and the dam sluices are closed, thus allowing the canal supply to run at its ordinary level. This is a most important work, and upon its accurate supervision depends the safety of the works lower down.

The next work is the deservedly famous Solani aqueduct. This great work is situated at the 19th mile from the head, at the point where the canal leaves the high land of the Ganges. The Rutmoo and Solani rivers are separated by a high ridge of land about 2 miles in breadth, through which the canal passes in a deep excavation. This runs out at the Solani Valley, which is 11,680 feet wide, or nearly 2¼ miles. The canal is now carried above the surface of the valley by an aqueduct 15,700 feet long. The masonry aqueduct itself, which crosses the river bed, is 920 feet long, and consists of fifteen arches each of 50 feet span (giving a clear water-way of 750 feet), with 9 feet piers. The width of foundations in piers is 252 feet, and the extreme width of water-way on top is 172 feet, by a maximum depth of 10 feet. It is divided in the centre by a wall throughout its length, and grooved to receive planks, in order that one half of the aqueduct may be closed if necessary. The canal level at this point is 24 feet above the Solani river-bed, and the whole work is of stupendous dimensions. The banks of the canal on the up-stream side of the aqueduct are revetted by masonry steps for a distance of 10,713 feet, and for 2,723 feet on the down stream, or Roorkee side; that is, a total of 13,436 feet. The embankment supporting this channel has a base of 350 feet, and a top width of 290 feet, which provides for a road on either side. At the time of my visit the velocity of water was 3½ miles per hour, and the depth on gauge 8 feet, or 2 feet below the maximum. The total height of the aqueduct above the river is 38 feet. The deficiency of elevation robs it of much of its grandeur when viewed from below, but above when its extreme width and length of masonry channel are viewed, the effect is most striking.

The foregoing is a brief sketch of the works on the first section, from the training works to Roorkee. It would be impossible to give anything like an estimate of the amount of labour expended on them.

The canal, after passing the high land of Roorkee, flows east of Mozuffurnuggur and west of Meerut, following the high land to near Bolundshuhur, where a short branch occurs, and continues to a short distance below Allyghur, where it terminates or, rather, diverges into the Cawnpore and Etawah branches.

The former flows on the high land between the rivers Esun and Rind, and discharges into the Ganges at Cawnpore, a distance of 170 miles, and navigable throughout. The latter continues through the high land, and after a course of 170 miles flows into the Jumna, near Humeerpore.

Throughout the length of the main canal and branches the longitudinal section is laid out in a series of steps, the length of tread and height of rise being determined by the profile of the country. These weirs or overfalls were originally designed in the form of an ogee, but it is now agreed that the vertical shape is the best. There are fourteen of these falls in a distance of 165 miles from the head, aggregating 110 feet. The falls consist of bridges, as already described, with varying numbers of arches, according to the waterway required. At 68 miles the canal is diminished in width to 150 feet, and at 149 miles to 100 feet to compensate for the quantity of water taken off for irrigating purposes.

The navigation in the canal is of minor importance, but in order to maintain it small channels 20 feet wide are constructed three-quarters of a mile above each fall, and re-entering the canal at about the same distance below.

On these channels locks are provided at the point corresponding with the weir or fall in the main channel. At most of these locks corn or sugar mills have been erected, worked by water power.

In consequence of local irrigation, and frequently to an irregular abstraction of water from the main channel, the equilibrium between the supply and the capacity of the channel is liable to be disturbed. At its source the climate is moist, but on entering the plain country the climate is entirely changed, and demands are made on the supply which varies with regard to climate and soil, and is greatly influenced by local rainfalls. These conditions are met by providing escape outlets at intervals along the line of the canal, so that when overcharged the surplus water may be passed off into side channels. These escapes on the Ganges Canal are situated about 40 miles apart. They consist of a number of sluices about 6 feet in width, are built in the side road, and are arched over so that a free passage is open to both traffic and water.

At the end of the main canals, where it divides into the Cawnpore and Etawah branches, are two regulating bridges, one over each branch, connected by a masonry wall. These bridges have each five openings of 20 feet, fitted with gates and apparatus to admit of proper subdivision of supply; and in cases of necessity one or other of the branches can be laid dry.

On both banks, along the whole line, plantations of useful shade trees have been formed. The distances are marked by substantial mile-posts, and at nearly every bridge are provided bathing ghats for the natives.

The Cawnpore terminal line passes the station near the Cantonment. At this point it has wide and handsome esplanades, with trees, ghats, and bridges, which are quite an ornament to the locality.

The junction with the Ganges is effected by a series of locks for the passage of boats to or from the Ganges or Cana.

The total length of main and branch navigable canals in this system is 890 miles, and 3,700 miles of distributing lines, along which are established 17 dams or escapes, 202 bridges for the purpose of traffic or regulation of supply, with waterways varying from 200 feet to 20 feet, 297 inlets for local drainage, 16 falls, and 31 locks and side navigable channels, and 282 outlet heads for irrigation. The

The preceding details will suffice to give an impression of the extent and dimensions of the Ganges Canal. Up to the end of 1877-78 the expenditure on the canal had been three millions and fifty-five thousand pounds (£3,055,000). The area irrigable is 1,205,000 acres.

The Lower Ganges Canal.

This is comparatively new work designed to compensate for the admitted fault of placing the head of the upper system so high up the river as Hurdwar. The work was recommended by Sir Arthur Cotton in 1863, and after some alteration in the design first proposed the work was commenced by the construction of the masonry weir across the Ganges, at Narora, in 1871. This weir is situated about 3 miles below the crossing of the Oudh and Rohilcund Railway at Rajghat, 30 miles from Allyghur, on the East Indian Railway. From this point the main canal traverses the Allyghur, Etah, and Mynpoorie districts, crossing the Cawnpore branch of the Upper Ganges Canal, 76 miles from the terminus, thence running westward of the town of Cawnpore to the district of Futtehpoor. The length of canal channel is 531 miles, of escapes 56 miles, of navigable channels 428 miles, distributaries for irrigation 1,834 miles.

The works at Narora consist of a masonry weir across the Ganges, having sluice openings only on the flank where the canal takes off. At the time of my visit I was unable to obtain the assistance of the resident engineer; the measurements given with the following description are therefore only approximate.

The weir sluices are divided in bays of 14 feet and 8 feet waterways; the shutters are of iron, with very improved apparatus for lifting. The weir is connected with the canal take-off by a wing wall, 130 feet in length, and the bank on the lower side is protected in a similar manner for the same distance. At the end of weir openings a ramped-wing wall, 7 feet wide, extends down stream 130 feet as a protection to slope of dam. The main dam or weir is constructed on a loose sand-bed, and the long down-stream slope is packed with large pieces of kunker in the absence of stone. The crest of the weir is 10 feet above the river-bed, but this height can be further increased by the use of iron shutters hinged to crest of weir. On the up-stream side of the weir the low nature of the country necessitates the maintenance of a bund for a distance of 5 miles, to prevent the spread of flood-water.

The water is taken off to the canal by thirty sluice gates, the width of inlet being 300 feet. The shutters or doors are fitted to the full depth of the river at entrance, and any silt that may collect at the entrance is removed by the scour from the sluices in the weir already described above. At a distance of 750 feet above the weir is the lock-entrance, with gates of the ordinary kind, the river bank for the whole length from weir to lock-entrance being protected by a masonry revetment, which also extends beyond and protects the upper wing of the lock.

The design and construction of this work embrace every improvement that long experience and modern science could suggest, and may be looked upon as a reliable type to follow in any works of a similar character projected in this Colony.

It is to be regretted that time and an unfavourable season did not permit of a thorough examination of this system, as the head works offer sufficient promise that all the details throughout would prove of a highly interesting and instructive character.

The Agra Canal.

This canal was completed in March, 1874, and the distribution of water commenced in the following cold weather. It commands an area of 375,800 acres. The head works of the canal are situated at Okla, 10 miles below Delei, on the River Jumna. The weir is 2,400 feet in length, and the crest is 7 feet above summer level of the river. The maximum height of flood at the weir is 11 feet, with a velocity of 5¼ miles per hour. The rear slope is composed of large size, hand-packed rubble, laid to an incline of 20 to 1. The through walls of the weir are laid directly on the river-bed, without block or well foundation. This was the first attempt at construction of this nature on a bed of the finest sand, and the work appears to stand well. At the end of the weir, where the canal takes off, there are sixteen sluice openings of 6 feet 6 inches each, flanked at the land side with a revetment extending down stream for protection of the bank, and up stream 60 feet, where commence the under sluice openings for canal supply. The width of canal is 100 feet, and the water entrance is arched over to form a traffic road. The masonry wall continues for 150 feet, and is then curved to entrance of lock communicating with canal. The whole of the work is executed in rubble, with brick strings and copings, and is of a very substantial character. The sluice-shutters are dropped in a cast-iron channel plate, and are lifted by a traveller provided with winch and gear, running on a line of rails attached to the piers. The depth of water at entrance is 8 feet, and the canal entrance is formed in excavation 20 feet in depth.

The main weir on the up-stream side is well protected with rubble stone, and, excepting at the entrance to sluice openings, is silted to level of dam crest. Shutters are now being fixed to the weir which will raise the level of the water impounded 3 feet 6 inches.

An embankment along the river margin for about 8 miles protects the low lands from inundation, and the chance of turning the flank wall.

From Okla the canal follows the high land, nearly parallel with the Jumna, at a distance of from 3 to 12 miles from the bank of the river, and finally discharges into the Utongou River, 20 miles below Agra. Branches connect the canal wish Muttra and Agra. Both of these are navigable, and when a full supply of water is obtainable boats can pass into the Jumna again at Agra. At the time of my visit the outlet was temporarily closed.

The discharge of the Jumna at Delhi in the dry seasons of the year is about 700 cubic feet per second, although the Upper System draws off the entire discharge of the Jumna, as it passes out of the Sewaliks.

The length of the main canal for navigation and irrigation is 140 miles, and the short junction to Agra and Muttra and length of distributaries 288 miles. The entire work cost £932,907, and the returns realized 10 per cent. on outlay.

New extension works are now in progress to make a navigable junction with the Western Jumna System at Delhi; and at its junction with the main canal near the head the excavations are heavy for some distance.

The foregoing is a brief sketch of the canals in the north-west provinces and Oudh, which I was enabled to examine during my visit; and for the assistance rendered in my inquiries by the officers in charge of the several works I am indebted to the courtesy of Lieut.-Col. J. G. Forbes, R.E., Engineer-in-Chief of the district.

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The following is an extract from a report on the highly prosperous condition of the irrigation works of the North-west Provinces, dated 22nd February in the present year:—"The gross assessments for 1882-3 amounted to £645,000, and the working expenses to £215,000. The net revenue is therefore set down at £430,000, which is equal to 6·36 per cent. on the capital invested. The length of main canals is now 1,384 miles, of the distributaries 5,596 miles, and of the drainage cuts 1,403 miles. The total irrigated area is no less than 1,974,175 acres, or 3,085 square miles."

The Sone Circle System—Bengal.

The country benefited by this system of canals lies southward of the river Ganges, near the junction of that river with the Sone. It comprises portions of the district of Shahabad, with Gija and Patna on the east. The first idea was to irrigate the Shahabad district from storage reservoirs in the hills; but subsequently the supply of water in the Sone River was found sufficient to irrigate an area of 800,000 acres. It was therefore finally determined to construct the works now existing, of which the following is a description, at a cost of £3,775,000, and to command an area, when complete, of 2,611,000 acres.

The estimate provided for irrigating 1,305,000 acres of rice land, and the allowance of water for this crop was fixed at 1 cubic foot per second for 133 acres; hence the eastern main canal was designed to carry 4,511 cubic feet per second, but, as will be shown further on, the expectation was not realized.

The excellent works on this system were commenced in 1869. The weir across the Sone, which is the headwork of this system, is situated at Dehree, about 27 miles below where the river leaves the Kymore range of hills. It is the longest weir in one length which has ever been built. It is 2¾ miles in length, and 8 feet high to surface of crest. The cill level is 326·00, and highest flood level 342·00. The flood therefore rises 8 feet over the crest of the weir, and discharges about 1,026,000 cubic feet per second. Its average minimum supply in the cold season is 3,000 feet per second, but at times in exceptionally dry seasons it has been known to fall below this quantity. The catchment area of the Sone is 23,000 square miles. The river runs for 225 miles through the hilly parts of Central India, until it reaches the plains of Rhotas. From that place it has a course of about 100 miles through an almost deltaic country, which is the area commanded by the Sone canals. For some 40 miles below the weir the floods do not overflow the banks, but below that point large areas are inundated. Up to the point where flooding occurs the canals on each side follow the line of river closely, and then follow the high ridge of the country down to the Ganges.

The following are the lengths of the navigable canals:—

Main Western	21½	miles.
Arrah branch	65	„
Buxar branch	45	„
Main Eastern	7	„
Patna branch	79	„
	217½	miles.

The length of branch canals is 107 miles.

In addition to the above there are 1,130 miles of distributaries connected with the mains. The full summer supply carried by the canals is ascertained to be 5,171 cubic feet per second, and the minimum at end of dry season 3,500 cubic feet; but it has been known to fall 500 cubic feet in a very dry year, about May and June. The total irrigable area is 1,100,000 acres, and the total area commanded by the canals is estimated to be 2,931 square miles, making the area irrigable about 70 per cent. of that commanded.

The headworks are situated 58 miles from Arrah, and the journey is performed by steamer. On this branch there are thirteen locks, two of which are double. Some two hours are occupied in passing the locks, which have an average rise of 12 feet each. The total fall from the bed of the Sone at Dehree to low water in the Ganges is 180½ feet, of which 161 feet are overcome by means of the locks, the difference being accounted for by the slope of the canal. The steamer used was a side wheel, with breadth over sponsons of 19 feet, for the clearance of locks, which are 20 feet wide in the clear. The passenger and goods traffic is considerable, and is said to pay.

At intervals of 2 miles pontoon bridges, or stages, are moored to either bank for the convenience of ryots who may wish to cross over themselves, or convey produce from bank to bank. And in addition there are frequent over-bridges for general traffic.

At the side of each lock, in a loop branch of the main canal, is a masonry weir, with a fall corresponding with that in the locks. The openings for discharge are regulated by boards fitted into slots worked in the masonry. At a short distance from, and on the upper side of, the locks are sluice openings for supplying the side channels, which in this system run on either side of, and parallel to, the main canal, and from which the distributaries are supplied, instead of from the main channel. The connection with the distributaries are made by village channels formed by the natives in any direction required, under the supervision of the local officers.

The Anicut, or main weir, is 12,351 feet long between the abutments. It is constructed of rubble masonry, having foundations of rectangular wells sunk in the river bed, supporting longitudinal walls 5 feet and 4 feet respectively placed 35 feet apart, the intervening space being filled with large ordinary packed rubble. The front or up stream slope is formed at 3 to 1, and the rear or down stream slope at 1 in 12, formed also of large size, hand-packed rubble. The packing on the crest is closely cemented.

There are three sets of under sluices in the weir, one at each flank and in the centre, each with twenty-two vents or openings of 20½ feet each. The piers between the openings are 4 feet thick, and 32 feet in length. These sluice piers are set in ashlar masonry to a height of 10 feet over river-bed. The shutters or gates used for closing the sluices are extremely novel in construction, being in a great measure self-acting. The shutters are arranged in two lines each at the end of the piers, fixed by hinges to sill of opening. The back of the up-stream shutter is supported by six tension rods, 2¾ inches in diameter in wrought-iron tubes, the rods being packed with leather to act as pistons. When the shutters are up the packing fits close to the inner surface of the tube. If it is desired to lift the shutters during a rise in the river they are raised by means of appliances 8 inches, when the pressure of the water does the rest, the shock of the sudden pressure being modified and injury prevented by the tube and piston arrangement.

arrangement. The front shutters being up, the back ones are easily raised. The space between them is then filled with water through a valve in the front shutter. When the water is in equilibrio the front shutter is again lowered to its bed, and one only is left to retain the water. The remaining shutter is attached to the floor by strong iron rods hinged to gate and floor, and fixed below the centre of oscillation, so that when the water rises beyond the height required to serve the canal the shutters fall and the river discharges itself throughout the whole length from bank to bank.

It was proved in my presence that by this admirable arrangement these shutters can be safely and expeditiously lifted against a 10-feet head of water without shock to the structure. It is an interesting and instructive sight to watch a stream of water 20 feet broad and 9 feet deep flowing with a velocity of about 18 feet per second through the sluices suddenly obstructed by a single gate. When the shutter reaches the vertical the water leaps in a wave 2 feet above the top and flows over for a few seconds, and then sinks to the mean level of the upper pool.

The set of gates in the centre being over a mile from the shore, it was on one occasion found impossible to reach it in time to disengage the chains, and to drop the shutters on the approach of a sudden flood. A great deal of damage was done in consequence to that portion of the work. Since then automatic means have been devised to meet the difficulty in future.

As in the case of all other headworks described, the revetment walls are continued some distance up and down river at right angles with the weir, the take-off for the canals being on each bank near the up-stream side of the weir. The western and eastern head sluices discharge 4,342 cubic feet per second. They consist of twenty-four vents of 6 feet each, fitted with gates in two panels, one or both in each opening being removed at will. Above them again on each side of the river is situated the navigable lock entrance.

The dimensions of the western main is, at the head, 180 feet in breadth of base, with slope 2 to 1, giving a surface waterway of 220 feet with a maximum depth of 9 feet, the fall being 6 inches per mile. Five miles from the head the canal branches to Arrah and Buxar. On the latter branch, at its junction, a regulator was being built at the time of my visit to compensate for increased slope and consequent excessive discharge. From this point the width of each canal is reduced to 124 feet, the Buxar branch taking off 2,895 cubic feet of water, and the Arrah 1,447 cubic feet per second. At the 12-mile the Chousa branch occurs, 1,226 cubic feet being taken off, leaving 1,669 cubic feet to be carried on. From this point the canal narrows to 100 feet, and the fall to 2½ inches per mile. At the 19th and 21st mile respectively the Khurgur and Chowbay branches take off, depriving the main canal of 620 cubic feet of water, leaving 1,049 cubic feet to be carried on to the end of the canal at the 22nd mile.

The Arrah branch has already been described, as seen on the trip up from Arrah; and the same description will apply to the branch on the eastern side of the river, the details in all cases being similar. All drainage streams are crossed by masonry aqueducts; the distributaries are supplied by side sluices arched over to carry roads; the banks are closely planted with trees, and light iron bridges with timber floors span the canals at frequent intervals. At some of the locks sugar and floor mills are worked by water-power applied by turbine, and are productive works. The same power, placed at the disposal of the enterprising settlers in this Colony, would be availed of to its fullest capacity. In India the Government provide the whole of the working appliances.

In concluding this brief description I must express great indebtedness to H. C. Levinge, Esq., C.E., late chief engineer of the works, for much valuable information, and to Lieut.-Col. J. M. Heywood, R.E., the present chief engineer, who provided means of transit, and placed at my disposal the valuable plans of his Department, and accompanied me for several days on a tour of inspection over the works. It is through the instrumentality of this gentleman that the Government of New South Wales has been furnished with complete sets of drawings and books of reference of the whole of the irrigation works of Bengal.

The distance travelled by rail, canal, and road, for the purpose of inspecting the foregoing works, was 2,740 miles, and the character of the climate of the country passed through was as various as the systems adopted by the natives in economising and distributing water for irrigation. It may, therefore, be interesting to describe the various methods of raising water in vogue among the natives of India.

Well Irrigation.—The two methods which are to be frequently met with between Calcutta and the north-west provinces are the pecotah, in Bengal, and the môt in the north-west provinces.

The pecotah is a lever fixed to an upright forked post, with a bucket attached to the short end by a rope, and a counterpoise at the other end. It is worked by two men, and it is stated that in six hours they can raise and distribute 1,500 cubic feet of water from a depth of 20 feet. When the depth is not more than 16 feet one man works the pecotah with the following results:—With a bucket containing 3 gallons and discharging 3 per minute, or 540 gallons per hour, or, deducting spillage, 4,000 gallons per day, which is sufficient to water two-thirds of an acre.

The môt consists of a leathern bag, having a leather pipe-like extension at the bottom. When the bag is filled it is raised by means of a rope, running over a pulley, worked by two bullocks walking down an inclined plane, either excavated or made over the surface to the level of the raised masonry of the well. At the side of the well is a trough into which the water is discharged. Three men and two bullocks work this appliance from morning till evening, with a mid-day rest of an hour. The bag contains 4·5 cubic feet, and can be raised thirty times in the hour, which gives a result of 6,720 gallons per day of eight hours.

Both of the above systems, notwithstanding the cheapness of labour, are considered very expensive compared with surface irrigation, and they are therefore of only very restricted application.

The wells generally are not very deep, reaching from 18 to 20 feet, but the supply in most parts is very scanty, and a very small depth of water remains while the môt is in use. The ordinary field well is simply a round hole, lined for a few feet of its height from the bottom with a plaited brush-wood casing.

The country in India, through which the great systems of canals are carried, resembles very much in appearance our western and north-western country. The main channels in every case are formed on the ridges to be found on each side of the main rivers. These ridges, which exist in varying widths, right and left of the river channels, have been formed by the gradual deposit of alluvial matter when the rivers have been in a state of flood, and they occur at points where the velocity of the stream is checked. The effect is to leave on each bank a stratum of silt, in the sectional form of a long wedge, with the thick end towards the river. The width of this slope on the plains of India varies from 300 yards to a distance of

many

many miles. Beyond these deposits, which occur also on all tributaries of such rivers, the country is low, and although not perceptible to the eye, yet instrumental examination shows in which direction the drainage tends to flow. The irrigation of India is therefore based on a very simple principle.

At all the sites selected as the head works of the several systems which I visited the river appears to have ceased to overflow the banks at time of floods. By raising the level of the water at these points by means of a fixed weir, and excavating a channel through the wedge deposit, the lower country is reached, and as the line of canal is carried in a straight direction, while the course of the river is tortuous, the fall is more rapid; for every mile of its course it then gains considerably on the surface level of the river. As an example, if the fall of the Darling or Murrumbidgee is 1 foot per mile, with a tortuous course of one half more than a direct line, there will be a gain of 6 inches fall in each mile in an artificial channel. So that if the excavation of the canal were 5 feet below the top of the river bank at the head it would gain that amount on the river in 10 miles. If the cut were made in ground on the same level as the margin of the river bank, the water it carried would then come to the surface, and be available for distribution.

But as the wedge-shaped alluvial deposit carries a fall at right angles to the axis of the stream as well as in its course, the required level would be obtained at a shorter distance, and as the fall in the cut need only be 6 inches in the mile the water would come to the surface in 5 miles. The foregoing is practically the system adopted in India. The excavations are made so as to be little more than sufficient to provide material for the embankments, which are made to retain the water at as high a level as possible consistent with their stability. And then occur the lock and weir as described in the Ganges and Sone systems.

In many parts of India large tanks or reservoirs are established in the upper watershed to collect and distribute by means of sluice regulators, the water which would otherwise inundate the lower land. These tanks are provided with escapes or waste weirs which convey the surplus supply to the natural bed of the drainage. The plan adopted is to select a natural hollow in good holding ground on the moderate slopes of the catchment area, by closing up all depressions on its sides where water can make its exit, and excavating in the solid, throwing the material into a dam or bund at the lower end. The supply for these tanks sometimes depends entirely on local rain, or on streams swollen by rain on the higher ground above; or, as is more generally the case, the tanks are filled by tanks connecting several of these streams, or by channels widening round more remote hills.

When practicable, the head of supply is cut off when the tank is filled, and the surplus water discharged into the natural channels; otherwise one or other of the following methods is adopted. When the banks at the site of the dam are high, as in the bed of a mountain stream, and of a great width, the dam is constructed entirely of solid masonry throughout, so that the waste water may pass over the whole length of the dam. If so large an escape is not desired and the embankment be of earthwork, then a portion of the dam is built in masonry, with the top 2 or 3 feet lower than the earthwork; but where the position is favourable several waste weirs excavated in the solid ground are much more reliable. In Mysore there are upwards of 20,000 tanks, the dams of which are of lengths from ¼ of a mile to 1½ mile. They are principally formed of earthwork, 12 feet broad at top, 60 feet on bottom, and 18 feet high. They are faced with a rough stone revetment, having a batter of 2 to 1, the facing averaging 3 feet to 4 feet 6 inches in thickness, packed on loose rubble backing.

The largest tank in India is the great Chembrambaukum, 9 square miles in area; it is situated 14 miles from Madras; its capacity is 102·91 millions of cubic yards, and the water spread is 5,729 acres, or 8·95 square miles. The Government is now considering the question of forming large storing tanks at the head of the watersheds under the mountains. In the Bombay Presidency five examples of tanks are found. The Ekruk tank is one of the largest of its class; it comprises a reservoir or tank formed by an earthen dam, and three canals for irrigation. The dam is 7,000 feet in length, and 76 feet in maximum height; it is thrown across the Adhila River, a tributary of the Lind. The drainage area above the tank is 160 square miles. The tank is 60 feet deep when full, and contains 3,350,000,000 cubic feet. The area of the water surface is 4,640 acres, or 7¼ square miles.

The Bhatode tank is situated on the Mekhri River, which rises 10 miles north-east of Ahmednagar. The masonry dam is 2,400 feet long, and 50 feet in maximum height, with a waste weir, 450 feet long, 7½ feet below the top of dam. A canal for irrigation is 4½ miles long, and is capable of discharging 140 cubic feet per second at the head, and commanding altogether 14,000 acres of land. The drainage area of the tank is 50 square miles, its capacity 149,000,000 cubic feet, and its area, when full, 310 acres. It is estimated to fill with a rainfall of 5·40 inches.

The Naini tank is situated on a small tributary of the Yula River. The work comprises a storage reservoir, capable of containing 190,000,000 cubic feet, and having an area, when full, of 380 acres. It is formed by an earthen dam 2,870 feet long, and 57 feet in greatest height. The catchment area of the river above the dam is 54 square miles. The canal leading from the tank has a discharge capacity at the head of 33 cubic feet per second.

There are in the Presidency seven smaller works of the same description, some of them undertaken entirely by the Government, and others being old native works restored.

In the Western Punjab, where rain is very scarce, and the ground near the hills at so high a level that it is impossible to irrigate it either from canals or wells, the natives obstruct the dry bed of the stream with dams formed of earth and brushwood at every favourable point, thus raising the level of the water, and directing it into secondary channels, natural or artificial, whose mouths are just above the dam. Each of these in its turn is bunded as may be required to throw the water in the smaller irrigating channels for distribution over the land. So skilful is this arrangement that although these floods last but a few hours the water is distributed in the above manner by hundreds of weirs and minor channels over a large extent of cultivation, with very few disputes.

The great defect in this system is that, if only a small quantity of water comes down, the dams lower down the stream go without, and if a large quantity comes down the violence of the torrent is too great, whereby the temporary dams are carried away in succession too rapidly, and a large quantity of water is wasted. If masonry dams were established in these places the water would be stored up for future use in the bed of the river. For example, in a creek 15 feet deep with a fall of 20 feet per mile, if dams were constructed every ¾ of a mile the surplus water passing over the tops in succession a series of still-water canals would be formed, whence the water could be drawn by smaller channels. By a proper application of this method there is little doubt that a great extent of country in this Colony now lying barren could be brought under irrigation.

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I regret that my duties in connection with the Calcutta Exhibition did not admit of my visiting the irrigation works of India before the season was too far advanced for extended inspection, and that from the same cause I was unable to go over the Madras and Bombay systems. But in the interest of future operations in the conservation of water in this Colony it would be of great service if a detailed report on works applicable here could be obtained from those provinces.

I have, &c.,
F. A. FRANKLIN.

REPORT ON RIVER-GAUGES, SHOWING LIST OF PRESENT AND PROPOSED SITES.

To the Secretary of the Commission,—

Sir, Sydney, 6 January, 1885.

I have the honor to report that, in accordance with verbal instructions received from the President, I have made inquiries regarding the most suitable sites for river gauges, and as the result of these inquiries I beg to submit a list showing the places at which gauges will be most useful on the various rivers of the interior.

2. While preparing the list I consulted Mr. Russell, the Government Astronomer, and Mr. Moriarty, Engineer-in-Chief for Harbours and Rivers, and obtained valuable information from them. The gauges on the Macquarie, Peel, Namoi, and Talbragar, are entered in the list, on the suggestion of Mr. Russell. Mr. Moriarty very kindly supplied me with a copy of a river gauge book which was prepared by him in 1864. The positions of suitable road bridges were obtained from Mr. Bennett's Department.

3. In order to obtain a connected record, the positions of the gauges relatively to Sydney high-water-mark should be determined. A table of discharges, corresponding to various readings of the gauges, should also be prepared.

4. With a few exceptions the discharges hitherto calculated have been only rough approximations. As the determination of the discharges of the rivers, and particularly the minimum discharges, is a matter of great importance, I beg to recommend that this question of gauges and discharges should receive early consideration, and that the necessity for sanctioning the expenditure required for fixing the gauges without delay should be brought to the notice of Government.

5. In addition to the list of gauge sites and the gauge book supplied by Mr. Moriarty, I append a gauge register sheet for daily observations, which I recommend for adoption. It is very similar to the rain-gauge register sheets supplied to observers by Mr. Russell. Owing to the increase of population and the spread of settlement, daily readings can more easily be obtained now than weekly readings at the time Mr. Moriarty's register book was prepared.

I have, &c.,
H. G. M'KINNEY, M.E.,
Engineer to the Commission.

River Gauges—List of present and proposed Sites.

No. of Gauge for each River in order.	River.	Proposed Sites of Gauges.	Bridges available for fixing Gauges.	General Remarks and Explanations.
1	Snowy River ...	.....		The available information regarding the Snowy River is not sufficient to enable me to suggest a site for a gauge.
1	Murray River...	Dora Dora		
2	Do ...	(L) Albury (R)	Railway Bridge & Road Bridge.	
3	Do ...	(H) Howlong	Timber Road Bridge.	
4	Do ...	(H) Wahgunyah or Corowa ...	Do do	
5	Do ...	(H) Mulwala (R)		
6	Do ...	(H) Tocumwal		
7	Do ...	(L) Moama (R)	Railway Bridge on iron cylinders.	
1	Edward	(L) Deniliquin.....	Timber Road Bridge.	
1	Murrumbidgee...	(L) Gundagai	Road Bridge on iron cylinders.	
2	Do ...	(L) Wagga (R)	Railway Bridge & Road Bridge.	
3	Do ...	(L) Narrandera	Railway Bridge on iron cylinders.	
4	Do ...	(L) Hay (R).....	Road Bridge on iron cylinders.	
1	Lachlan	(L) Cowra	Timber Road Bridge.	
2	Do	(L) Forbes	Do do	
3	Do	(L) Condobolin	Do do	
4	Do	Hillston		
5	Do	Oxley	Road Bridge on 5" screw piles.	
1	Murray—Murrumbidgee—Lachlan.	(H) Euston (R)		At the places marked "(L)" the gauges will easily be connected with the railway levels.
1	Murrumbidgee—Lachlan.	(H) Balranald (R)	Road Bridge on iron cylinders.	It may not be practicable to level to the remaining sites at the time of fixing the gauges; but the gauges should eventually be levelled in every case, as, until this is done, the observations though useful will lack completeness and continuity.
1	Talbragar.....	Brocklehurst	Timber Road Bridge.	
1	Macquarie	(L) Dubbo	Railway Bridge.	
2	Do	Warren.....	Timber Road Bridge.	
1	Peel—Namoi ...	(L) Tamworth.....	Bridge.	
2	Do ...	(L) Gunnedah	Do	
3	Do ...	(L) Narrabri	Timber Bridge.	
4	Do ...	(L) Walgett.....	Timber Bridge over the Namoi.	
1	Macintyre—Barwon—Darling.	Goondiwindi	Timber Road Bridge.	While the list includes the sites at which gauges are most necessary, other gauges would be useful, and records kept by private observers would be worthy of note.
2	Do	Mungundi	Do do	
3	Do	(L) Walgett.....	Timber Bridge over the Barwon.	
4	Do	(L) Bourke (R)	Road Bridge on iron cylinders.	
5	Do	(L) Wilcannia (R)		
6	Do	(H) Menindie (R)		
7	Do	(H) Pooncarie (R)		
8	Do	(H) Wentworth (R) ...		
1	Murray—Darling.	Moorna.....		

H. G. M'KINNEY, M.E.,
Engineer to the Commission.

THE

NEW SOUTH WALES.

ROYAL COMMISSION—CONSERVATION OF WATER.

REGISTER of Gauge at River for the Month of 18 .

Day.	Reading.	Remarks.
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Observer.

In the column of remarks, any trustworthy information regarding the changes of level during the interval between the gauge readings should be briefly noted; also particulars of any considerable accumulation of silt in the locality. Such information should, if possible, include the time of the beginning or end of any rapid rise or fall of the river. Any heavy fall of rain should also be noted.

(By Authority) H. G. M'KINNEY,
Engineer to the Commission.

REPORT ON RAILWAY AND OTHER LEVELS IN THE INTERIOR OF THE COLONY.

To the Secretary of the Commission,— Sydney, 15 January, 1885.

Sir,

In accordance with verbal instructions received at the last meeting of the Commission, I have the honor to submit the accompanying report, which is based almost entirely on levels received from the Railway Department and from the Department of Harbours and Rivers.

2. Next to the fixing of gauges and the determining of the supply in the rivers, I consider that the two sets of levels recommended in the report are the most necessary field work in connection with water conservation on a large scale in the interior of the Colony.

I have, &c.,
H. G. M'KINNEY, M.E.,
Engineer to the Commission.

(A.) The levels taken by the Railway Department and by the Department of Harbours and Rivers afford only a general idea of some parts of the Colony, and conclusions arrived at from them can only be considered as approximate. Bearing this in mind, the available information permits of the following deductions:—

1. That the fall from the place where the Billabong Creek is crossed by the Great Southern Railway to Jerilderie is over 300 feet, or at a mean rate of more than 4 feet per mile; also, that from Jerilderie to the junction of the Murray and Murrumbidgee the fall is about 170 feet, which is at the rate of about 13½ inches per mile.
2. That the country between the Murray and the Murrumbidgee must be regarded as two main doabs and not one, the Billabong Creek representing the intermediate river.
3. That so far as levels are concerned, the Billabong Creek could be supplied from the Murray as well as from the Murrumbidgee.
4. That the levels of the country are not sufficiently known to enable any one to state positively that high level canals commanding large areas could be constructed, but that all the evidence available goes to show that such canals could be carried out from both the Murray and the Murrumbidgee.
5. That the flood-water of both rivers can be utilized to some extent; that of the Murray in the Edward River and the creeks flowing into it, and that of the Murrumbidgee in the Yanko, Columbo, and Billabong Creeks.
6. That the practicability of useful work in this part of the country is so assured that cross sections from the Murray to the Murrumbidgee should be taken at every 5 miles, with a view to determining the nature of these works.

(B.) In the district between the Murrumbidgee and the Lachlan very few levels have been taken, and the information available from all sources is very meagre. The only conclusions justifiable regarding water conservation in this district are:—

1. That it is improbable that flood-water from either the Murrumbidgee or the Lachlan can be conveyed to any great distance in the interior of the district.
2. That the flood-water from both rivers can be utilized to some extent by diverting it into creeks and natural depressions in the low land near them.

(C.) Taking into consideration the great extent of country between the Lachlan and the Darling, but little information of a definite nature is available regarding it. There is, however, sufficient to lead to the following conclusions:—

1. That the Willandra Billabong is a great natural inundation canal, which should be surveyed and levelled with a view to its improvement.
2. That there are unusual natural facilities for utilizing the flood-water of the Darling in creeks, ana-branches, and lakes, particularly in the portion of the river south of Wilcannia; and that on this account a line of levels should be taken along the Darling, and branch lines from it to the lakes and large natural depressions.
3. That it is improbable that any supply of water can be taken from the Bogan in the direction of Cobar.
4. That the Macquarie could probably be diverted into the Bogan.
5. That the fall from Narrabri to Walgett is about 260 feet. The direct distance being about 100 miles, the fall in the country in the direction of the river is slightly over 2½ feet per mile.

(D.) No connected levels have been taken in the country beyond the Darling.

H. G. M'KINNEY, M.E.,
Engineer to the Commission.

FURTHER REPORT ON LEVELS.

To the Secretary of the Commission,—

Sir, Sydney, 22 January, 1885.

In continuation of my report of 15th instant, and in accordance with verbal instructions received on that date, I have the honor to furnish, for the information of the Commission, plans showing a number of levels obtained from the Railway Department and from the Department of Harbours and Rivers.

2. The scale of the plans does not permit of the entry of levels at less intervals than 2 miles, but those which have been entered will give a fair general idea of the slope of the country on the various lines on which they are marked.

3.* The Railway Department cannot give any information about the trial line to Wilcannia, as the books and sections have not yet arrived in Sydney. This information will be available in about a month.

4.* The Deniliquin and Moama Railway Company has been asked for information regarding the levels of the country along that line, but a reply has not yet been received. 5.

* The levels to Wilcannia have since been received from the Railway Department, and the Secretary to the Deniliquin and Moama Railway Company has courteously supplied a list of levels of the country along that line of railway. In both cases the information so obtained has been summarized and shown on the map of the Colony appended to the Report.—H.G.M'K.

5. Under these circumstances, I can add to my report of 15th instant only the following items of information:—

A. That the town of Cobar is 200 feet above the flood-level of the Bogan at Nyngan.

B. That at 58 miles from Nyngan and 22 from Cobar the Railway line crosses a ridge at an elevation of nearly 500 feet above the flood-level at Nyngan.

6. The levels now supplied include all those of the western plains which are at present available.

I have, &c.,

H. G. M'KINNEY, M.E.,

Engineer to the Commission.

REPORT ON THE TANTANGARA BASIN, UPPER MURRUMBIDGEE.

To the Secretary of the Commission,—

Sir, Cooma, 15 March, 1885.

In pursuance of instructions received, I have the honor to transmit herewith a plan showing traverse and section, also cross sections and contour line on west side of part of the Murrumbidgee River, in the parish of Tantangara, county of Wallace.

I have to observe that, on arriving at the locality, I found that the area of water to be impounded, unless by a dam of exceptional height, was much less than my impressions (of sixteen years since) led me to suppose; but I have executed such survey as I considered desirable, in order to place before the Commission such an amount of information as would guide them in forming an opinion of the value of the site for storage purposes. I did not consider myself justified, under the circumstances, in entailing further outlay.

From the plan* it will be seen that, with a height of 83·09 feet above water level at C, there will be a height of 44·66 feet at J, the junction of Currangorambla Creek and the Murrumbidgee River; the direct distance between these points is about (by scale) 272 chains, and the average fall per mile is 11·3 feet; with this proportion the contour line, if produced, would extend up the Murrumbidgee above its junction with Currangorambla Creek about 3¼ miles.

With a view to the possibility of the water being retained by a series of low dams I have shown a section of the river at T, where I observed there would be a natural by-wash. I may point out that from this point of the river upwards there are, I believe, many suitable points for the erection of dams, so that the whole bed of the river may be made a reservoir.

On my arrival at Tantangara there had then been but little rain for some time; the river was then running at the rate of (I estimate) 2 miles per hour, with an average depth of 6 inches at or about the point C; while there very heavy rains fell, but the river did not rise more than 2 or 3 inches, and the water was but slightly discoloured; there are no evidences of scour, nor is there any drift or timber brought down by flood-waters from the head of the river to the Gulf. I am informed by old residents that in high floods (for the locality) the river is crossable on horseback at and above the point D, shown on plan; that during the past, and in all seasons, the river maintains an even flow during the summer of about the delivery estimated in the former part of my letter. The whole country towards the head of the river is of a spongy nature (in flat lands), and two very constant streams, Nungar and Tantangara Creeks (also flowing from swampy country), flow into the river. There are, I believe, many minor streams of same character running into the river above the junction of Tantangara Creek and Murrumbidgee River.

While in the locality I inspected Currangorambla Creek for some distance up its course, at the south-west corner of portion 2, parish of Currangora, county of Cowley. I observed there was a site for a dam, with a natural by-wash to the east; above this point the bed of Currangorambla Creek (which flows slowly) opens out, and I am of opinion that a large amount of water could be impounded.

I will draw the attention of the Commission to the question as to whether a series of low dams from the Gulf upwards to the head of the Murrumbidgee River and tributaries would answer the purpose of conserving the water to a valuable extent.

I made inquiries as to whether stone for building purposes could be obtained; and I find that large quantities of basalt, in long lengths, can be obtained about the junction of Tangangara Creek with river; limestone can be obtained within a few miles; there is also an abundance of clayey loam in the immediate vicinity of the Gulf.

I have, &c.,

CORNELIUS HAYLOCK,

Licensed Surveyor.

REPORT ON MR. HAYLOCK'S SURVEY OF THE TANTANGARA BASIN, UPPER MURRUMBIDGEE.

8 April, 1885.

Although, in his report, Mr. Haylock expresses disappointment with the Tantangara Basin, I do not think that his report and plan are by any means discouraging. Mr. Haylock's plan and sections show that with a dam having a mean length of about 300 feet, an extreme height of about 84 feet, and a mean height of about 60 feet, the water of the Murrumbidgee would be thrown back to a distance of about 6½ miles. So far as I can judge from the plan, it seems probable that the reservoir so formed would average 40 feet in depth throughout a width of a third of a mile. The quantity of water thus impounded would be 2,416,000,000 cubic feet. If the gap at the lower end of the Tantangara Basin would afford a good foundation for a dam of masonry or concrete, such a dam could be built at a cost of about £40,000. The rate which the water impounded would cost would thus be 3,020 feet for one shilling. This rate is too high to admit of the use of the water for ordinary irrigation purposes; but it is very probable that the capacity of the reservoir is here understated, as several creeks flow into the Tantangara Basin, the valleys of which would afford considerable storage.

It would appear from Mr. Haylock's report that the discharge of the Murrumbidgee at Tantangara was about 183 cubic feet per second at the time of his survey.

Considering that the Tantangara Basin would, on a low estimate, contain sufficient water to give a supply of 200 cubic feet per second for 140 days, I think that, although the cost of storage (judging from the information available) seems high, the basin is well worthy of a more complete examination.

H. G. M'KINNEY, M.E., M.I.C.E.,

Engineer to the Commission.

REPORT

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* The plan is retained in the office of the Commission.

REPORT ON THE RIVER MURRUMBIDGEE AS A SOURCE FOR CANALS.

8 April, 1885.

Along the course of the Murrumbidgee the country may be considered mountainous as far as Wagga. Regarded as a source of supply for canals, this river is very similar to the Murray, and similar difficulties would attend the construction of canals above the point where it reaches the open plains. The time at my disposal did not permit me to follow the course of the river throughout the length between Gundagai and Wagga, but I examined the plans in the office of the District Surveyor, and obtained much valuable information from that gentleman in reply to questions which I put to him. In consequence of information so obtained I saw the advisability of visiting the Malibo Range, and the District Surveyor very kindly undertook to drive me to it. The Malibo Range is about 6 miles by road from Wagga, and is the last range which crosses the river before it emerges into the open country. The width of the gap through which the river flows appears to be under half a mile. The Malibo Range occupies the same position on the Murrumbidgee as the Jindera Range on the Murray. Both places are favourable sites for weirs; but that on the Murrumbidgee is at the narrower gap, and a weir there should be less expensive than on the Murray.

From the "summer level" at Wagga to the ground level at the junction of the Yanko and Colombo Creeks there is a fall of 138 feet. The rate of fall in the Murrumbidgee, near Wagga, is under 1 foot per mile; it would therefore be practically correct to assume that the summer level at the Malibo Range is about 128 feet above the ground level at the head of the Colombo Creek. As the distance is about 56 miles, the fall is at the rate of over 2 feet per mile.

With regard to the available supply, my instructions in regard to taking discharges did not include Wagga, so that I cannot state the discharge there; but at Gundagai I found that it was 630 cubic feet per second. It is evident, under these circumstances, that the prospect of a remunerative permanent canal from the Murrumbidgee, as well as from the Murray, is most promising. Before entering more fully into the subject, it will be necessary to make a further examination of the river and take the discharge at Wagga.

On the subject of inundation canals from the Murrumbidgee, some time ago, in my report to the Commission regarding the Yanko Creek, I pointed out that that creek must be considered as an inundation canal. My instructions then did not include a complete examination of the Yanko Creek, but related merely to improvements near its head. I hope that the improvement of the entire creek will yet be taken up, as I think that in every case such a work should be dealt with as a whole.

In addition to the Yanko, I have reason to anticipate that at least two other useful canals of the same description can be made to carry a supply of flood-water from the Murrumbidgee at a moderate cost. I think it is better, however, to postpone entering into detail till I am in possession of more complete information.

In conclusion, I have only to add that, while I confidently anticipate that canals will be found to be practicable in the district between the Murrumbidgee on the north and the Billabong and Edward on the south, still I think that a further examination of the Murrumbidgee is necessary in the first place, in order to determine the lines which the survey for such canals should take.

H. G. M'KINNEY, M.E., M.I.C.E.,
Engineer to the Commission.

REPORT ON THE RIVER MURRAY AS A SOURCE OF SUPPLY FOR CANALS.

8 April, 1885.

In considering the question of tapping the Upper Murray, there are two arrangements which suggest themselves. The first is to carry the supply along the Murray Valley, at an increasing elevation above the river, till a place is reached at which the canal could leave the valley and take a north-westerly direction to the open plains. The second arrangement is to draw the supply from some point at such an elevation that the water could be carried through or over the dividing range between the watershed of the Murray and that of the Upper Billabong.

The investigations which I have already made, together with the past records regarding the supply in the Murray, afford ample evidence that the available discharge is sufficient to warrant the construction of a canal, if such a work were proved to be practicable.

The supply then being available, the next point to consider is the nature of the river valley. From examination of the plans in the Office of the District Surveyor in Albury, from inquiries which I made of that gentleman, as well as of Mr. Basil Gray and others who know the district thoroughly, and, lastly, from my own observation of the river up to 12 miles from Maraket, I came to the conclusion that there was no chance of constructing a canal beyond the Seven-mile Creek, so that it was unnecessary for me to go beyond that point in my inspection.

From the Seven-mile Creek down to some distance below Wagra the river valley varies generally from half a mile to three-quarters of a mile in width. The hills are steep, and in most cases of granite. Their slopes are rugged, with out-cropping rocks, and the soil consists chiefly of loose and porous granite detritus. The soil at the foot of the hills is of the same composition, while that in the river valley proper is a light, sandy, alluvial deposit. The porosity of the soil is at once apparent; but, in addition, substantial evidence of this is afforded by the numerous surface springs, and by the manner in which the water flowing in some of the small watercourses appears and disappears. The river follows a tortuous course along its valley—sometimes washing the base of the hills on the New South Wales side, and sometimes passing close to those on the Victorian side. The rate of fall in the Murray near Albury, and on the up-stream side of the Union Bridge, is under 2 feet per mile, while at Dora Dora, which is 40 miles by road above Albury, the rate of fall is scarcely 3 feet per mile. From inquiries which I made, and from my own observations, I have no doubt that for the purpose of a preliminary investigation such as this, it would be safe to assume that the mean rate of fall from Dora Dora to Albury is not more than 2½ feet per mile.

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The various points enumerated show that the valley of the Upper Murray is very ill-adapted for canal construction. The hills are steep and rugged, and come in some cases close to the water's edge; the rocks are of the hardest description; the soil, as a rule, is of an unsatisfactory character, and the fall in the river is so slight that any gain in head which could be obtained would be acquired at a cost absolutely prohibitive. The idea of tapping the Upper Murray and bringing a supply down the river valley may therefore be dismissed as impracticable.

With regard to the second arrangement for obtaining a supply from the Upper Murray, namely, by carrying it through or over the watershed dividing the Murray from the sources of supply of the Upper Billabong, examination of the plans in the Office of the District Surveyor at Albury was sufficient to show that if it were possible to carry out this project the canal head would require to be between the Dora Dora Station and the Seven-mile Creek. Beyond the latter place the distance of the Murray from the watershed of the Billabong increases, while there is no increase in the rate of fall in the river. For this reason I selected Dora Dora as the place for ascertaining the discharge and the rate of fall of the Upper Murray. As already stated, the rate of fall in the Murray from Dora Dora to Albury may safely be taken at 2½ feet per mile. The distance by road is about 40 miles, and by river about 80 miles. The reduced level of the surface of the Murray at Albury was 490, so that when I measured the discharge at Dora Dora the reduced level there could not be much over 690. The flood level of the Billabong at Culcairn is 694, and the bed level of the creek at the same place is 673. The distance of the Murray opposite Basin Flat from Culcairn is over 30 miles in a direct line, and the intervening country is mountainous throughout. Although the estimated reduced level of the river at Dora Dora must only be regarded as approximate, it is abundantly evident that the Woomargama Creek, which is a mountain stream flowing into the Billabong from within a few miles of Dora Dora, must be at a much higher level than the Murray, and therefore could not be utilized in carrying a supply to the Billabong. Yet this Woomargama Creek is in a more favourable situation than any of the other sources of the Billabong for the purpose of carrying a supply from the Murray. It is also clear that if it were possible to divert a supply from the Upper Murray to the Billabong—which is extremely doubtful—tunnelling would be required on such a scale as to make the undertaking altogether impracticable.

The points which have been advanced to show the impracticability of canals from the Upper Murray as far as the Seven-mile Creek would hold with much greater force in regard to the portion of the river beyond that place. Still, as the main objection to the idea of diverting the Upper Murray into the Billabong arises from the want of sufficient fall from the Murray, and as the levels of the Upper Murray have only been deduced approximately, I think it would be advisable to place the matter beyond dispute by levelling the Dora Dora from the Railway Station at Bowna.

Although there would be an advantage in diverting the whole available supply from the Upper Murray, still the main purposes of drawing a permanent supply from that river can be gained without the expense of carrying a canal through difficult and hilly country. I believe it will be found that the first, and probably the only place on the Murray at which a permanent canal can be taken off at a remunerative cost, is situated on the Bungownah, or Bungowannah Run, at the end of the Jindera range of hills, and near the boundary of the counties of Goulburn and Hume. At the place where the river meets these hills it flows in a north-westerly direction and close to the foot of the range, which is here steep and rocky, with rough masses of granite cropping out over the hill face, and granite boulders forming the river bank. As it emerges from the range the river turns off almost due west, having an alluvial flat of increasing width on its northern side. At this place, where the river changes its course, there is a bar of pebbles forming a rapid, the difference of level above and below the bar being about 6 inches. This bar is at the place at which I think a weir can be constructed with advantage to throw a supply along a canal, which for a short distance near the head would follow the line in which the high ground meets the alluvial flat. The length of the weir proper would be only about 250 feet; but protective works might be required at some places on the low land, extending to the foot of the hills on the Victorian side of the river. The banks of the river were from 12 to 13 feet above the surface of the river at the time of my inspection. By using a movable weir, which would remain raised only while the supply in the river was low, and which would lie flat in the river-bed during floods, I believe it would be quite practicable to obtain a permanent supply without interfering with the flood levels.

The points in favour of the proposed site are as follows:—1st. It is at the last range of hills, with only open plain country beyond, so that there would be no rock excavation and no difficult country to pass through. 2nd. The river valley is at this place moderate in width and bounded by hills. 3rd. The depth of cutting, so far as can be judged without a survey, would be comparatively slight from the outset.

The distance of the Jindera hills from Albury by river cannot be more than about 10 miles, and the fall in that length is at the rate of about 1 foot per mile. The reduced level of the water surface, as I found it, must therefore have been 480, or very nearly so. The reduced level of the country around Jerilderie may be taken as 361, and that at Deniliquin as 289. The former place is 78 miles, and the latter 111 miles, from the proposed canal head. From the Murray at Jindera hills to Jerilderie there is therefore an average fall of more than 18 inches per mile, and between the same place and Deniliquin a fall of nearly 1 foot 9 inches per mile. As the fall of the country is regular and in a westerly and north-westerly direction, the conditions are remarkably favourable for the construction of a permanent canal for irrigation and water supply in the upper portion of the district between the Murray and the Billabong Creek.

In considering the discharging capacity which should be adopted for such a canal, the question whether the navigation of the river can be interfered with at once suggests itself. Navigation as far as Albury is considered practicable when the height on the old gauge there is at least 4 feet, that is when the surface of the river there is about 494 feet above sea-level. The discharge at Albury at the time of my visit was nearly 1,200 cubic feet per second, and the river was only 490·21 feet above sea-level. If a canal carrying 1,000 cubic feet per second were constructed, the navigation level would probably be raised to 7½ feet on the gauge. The question as to the effect on the navigation at Echuca and other places could not be determined without further investigation into the sections and discharges at those places. I have not at present any means of estimating the value of the navigation which would be lost through the abstraction of such a supply; but, in regard to the advantages which would be acquired, I may mention that 1,000 cubic feet per second should irrigate about 200,000 acres of land, and as £1 per acre per annum would not be an excessive rate, the gross revenue arising from the distribution of that quantity of water would

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be £200,000 per annum. A canal having a bed width of 62 feet, slopes of 1 to 1, a depth of 6½ feet of water, and a fall of 1 in 5,000—that is slightly over 1 foot per mile—would discharge the quantity assumed.

In connection with the available supply there is still another question, namely, whether the quantity of water flowing into the Murray, in the Mitta Mitta and Little Rivers, can be depended on. This also is a matter requiring further investigation.

On the whole there is a strong probability that a remunerative permanent canal can be constructed from the Murray at the place mentioned. For the design of such a canal, accurate surveys and levels, carried out on a comprehensive scale and in a systematic manner are indispensable.

The canal which has already been discussed would carry a permanent supply, and utilize the whole available portion of the minimum discharge of the Murray near Albury. In addition to this, I have ascertained that much can be done in saving flood-waters by means of what in previous reports I have termed "inundation canals." The first place at which there appears to be any prospect of such a work being practicable is at Howlong. The hills on the New South Wales side of the river gradually become lower and more distant till Howlong is reached, and there they almost entirely disappear. Near Howlong, and extending in a direction approximately parallel to the river, there is a valley, or rather depression, between the river and the hills. This valley is separated from the river by a ridge along which a ridge passes from Albury to Corowa. At Howlong there is a low and narrow place in this ridge, where it is said that in extraordinary floods the water passes over into the valley beyond. It is also alleged that in high flood a channel called the Twelve-mile Creek receives a supply from the Murray through a lagoon at Howlong, and that in exceptional cases the flood-water passes along this creek to the Billabong at about 10 miles from Jerilderie. Some of the farmers at Howlong believe that if the ridge were cut through, a supply could be obtained from the river in ordinary floods at very little expense. This is doubtful, but the question is worth further investigation.

From Howlong to beyond Corowa the high land bordering on the alluvial flats, through which the Murray flows, appears to range from 30 to 40 feet above the ordinary low supply in the river. It seems very improbable that any supply of flood-water can be drawn from the Murray throughout this distance.

Between Corowa and Tocumwal the level of the country becomes lower relatively to the river, and the colour of the soil becomes darker. In the neighbourhood of Tocumwal the ordinary surface of the river is only about 10 or 12 feet below the surrounding country, and the township is situated on the only piece of land which is not liable to be covered in high floods. Here the practicability of inundation canals on an extensive scale is beyond question. The river banks, as already stated, are low, the surface of the surrounding district is remarkably uniform, and the ground has a steady fall from the river in a north-westerly direction. Beginning at Mr. M'Farlane's Baruga Station, and about 8 miles up-stream from Tocumwal, there is a series of creeks into which the flood-water of the Murray occasionally flows. It is not unlikely that the levels and surveys will show that several of these creeks can be utilized with advantage; but so far as I could ascertain in the limited time at my disposal, the Tuppal Creek will be the most easily dealt with in proportion to the benefits it will confer. Commencing as an ill-defined depression in the ground at the bank of the Murray, about 2½ miles down-stream from Tocumwal, the Tuppal Creek becomes deeper and better defined, till at 12 miles from Tocumwal its depth is about 12 feet and its top width about 35 feet. This creek is here very similar in appearance to the Yanko, to which it is in other respects a counterpart, as its relation to the Murray corresponds exactly to the relation which the Yanko Creek bears to the Murrumbidgee. There is, however, a difference in regard to the manner in which the Tuppal receives the flood-water. When the surface of the Murray at Albury is 9 or 10 feet above what is then termed "summer level," no supply is received into the Tuppal Creek at its head; but the flood-water passes into it through several small creeks near Wopperana. The most important of these small creeks are the Narangi, Tuppal, and the Native Dog Creeks. Before the flood-water will pass into the Tuppal Creek at the head, the height on the gauge at Albury must be 12 feet or more, that is, the reduced level of the surface of the river at Albury must be about 502. Mr. Brown, the owner of the Tuppal Run, was so confident of being able to obtain a good supply from the head of the Tuppal Creek in ordinary floods, that he endeavoured to secure the co-operation of his neighbours and carry out the necessary work as a private enterprise. I think it is better that this arrangement was not followed out, as it is improbable that anything more would have been aimed at than providing a partial supply in the first 20 or 30 miles of the creek. That the question is one which merits treatment on a comprehensive scale is at once evident, when it is considered that the fall from the flood level at Tocumwal to the ground level at Deniliquin is 77 feet, and from the latter place to the junction of the Murray and Murrumbidgee 100 feet, and that the fall, as far as can be judged, is regular.

After examining the levels which I compiled for the Commission from the plans and records in the Government Departments, I ventured to give the opinion that there was then sufficient information to warrant the expense of a complete set of cross sections of the country between the Murray and the Murrumbidgee. In this report I have dealt only with that portion of the country between the Murray on the south, and the Billabong Creek and Edward River on the north. The paramount importance of canals in this district is indisputable, and I think I have shown clearly that the practicability of constructing them is beyond question. Under these circumstances, and considering the extent to which this part of the country is sometimes devastated by droughts, I think the necessary surveys and levels should be commenced without delay. It is almost unnecessary for me to add that the more complete and comprehensive the surveys are made, the less will be the first cost and the subsequent maintenance of any works which may be undertaken.

H. G. M'KINNY, M.E., M.I.C.E.,
Engineer to the Commission.

REPORT

REPORT ON THE NAMOI RIVER.

To the President and Members of the Commission.

Gentlemen, Sydney, 15 April, 1885.

In accordance with your decision, at a meeting of the 19th March, I have inspected the Namoi River in the neighbourhood of Gunnedah and Narrabri, with special reference to certain sites for the conservation of water, suggested by Mr. T. K. Abbott, S.M., in his evidence before the Commission in October last, and I have the honor to forward you my report thereon.

Reservoir site, No. 1.

The first site examined is situated at a point on the Namoi River about 2 miles from Carroll, where a spur from a conspicuous conical hill strikes the right bank of the river. This spur would form the western extremity of the proposed dam, whilst the eastern end would abut on a long spur about 2 miles from the opposite bank of the river. The banks are steep, and vary in depth from 20 ft. to 30 ft., and the channel is about 50 ft. wide. The country between the above spurs and on the site of dam is almost level, and is composed of post tertiary alluvial drifts which have not been bottomed. Wells have been sunk on this plain to a depth of 30 ft., when a constant and ample supply of water for stock and household purposes was tapped. A brief inspection of this position satisfied me that it was unsuitable for a dam, because of the great distance of deep permeable country between the bounding spurs.

Reservoir site No. 2.

The next site I inspected is situated in a gap in one of the numerous ridges crossing the country in this vicinity, and in proximity to the western boundary of the parish of Yarrari. This gap is about a mile wide, and is intersected by the Tulcumbah Creek. A hard conglomerate spur immediately approaches the left bank of the creek, and dips under it apparently on the line of strike at an angle of 10 degrees. The country rises very gradually till it meets the opposite spur, which consists of porphyritic rock. The country between the spurs is composed of deep alluvial drifts, which have been proved by two wells sunk at some distance apart and on each side of the gap to be over 140 feet deep. There is therefore the same insuperable objection to dam constructions in this position as before in the first site.

Reservoir site No. 3.

The third position I examined is situated on the Namoi River, about 1½ mile north-west of Mr. Winter's head station, and in the parish of Namoi, about 7 miles by river course above the junction of the Peel River. At this point the Namoi has cut through a bold ridge of hard conglomerate, which forms steep banks on either side. (*Vide plan in accompanying portfolio.*) At about 100 yards higher up the river it is flanked by a basaltic dyke, which separates it from a hard blue encrinital limestone belt traceable for miles, at times forming conspicuous and detached ridges or spurs, and at times, as in this instance, sinking so as only to be just visible above the surface of the ground. This narrow gorge offers many advantages for the construction of a dam. Its base and extremities would be embedded in the solid rock of the above ridge, which appears to terminate the divide between the Namoi and Peel Rivers. A dam 75 feet high would only measure 115 feet across at base, and 812 feet across at top. There is abundance of material in the vicinity for its construction. It would require to be an overshot dam, to provide for the contingency of an extensive flood discharge; consequently it would have to be constructed of solid masonry in cement, or on the same principle as the mining storage reservoirs in California. Such dams have proved very successful there to a height of 70 feet, at a cost of only 12s. per yard. They consist of dry masonry, lined in front with 3-inch planking to prevent leakage. The faces are built up by hand, and the interior filled with stone thrown in promiscuously. The outlet could be formed by a tunnel piercing the spur on the right bank of the river, and the by-wash by a cutting of about 20 feet in a depression of the ridge, about a mile from the left end of the dam.

Advantages.

Such a dam would throw the river back about 13½ miles, and would enclose a large basin, which, judging from Mr. Higinbotham's partial survey, would impound over 10,000 million gallons of water. Thus all the conditions for the construction of an extensive reservoir at this position appear highly favourable, especially as regards the position of the dam and the facilities for its construction at a moderate cost, as also regards the natural advantages for a capacious by-wash and outlet tunnel, and the firm impermeable bed generally of the basin it would enclose.

Objection.

There is, however, one grave objection to such a project, in the deposition of silt during floods and freshes. From reliable authority I am led to conclude that this deposit is enormous. Some are of opinion that it could easily be prevented from accumulating by a large sluice in the dam or outlet tunnel. But any such attempt to provide for the discharge of flood-waters would be hazardous, very costly, and would in every probability prove a failure. Further, any fresh as it met the rim of the reservoir would at once begin to lose its velocity and to deposit silt. Such a dam, therefore, in the course of a few years would completely alter the present *régime* of the river, gradually raising its bed and necessitating expensive works for its restoration to primal conditions.

Objection modified.

This difficulty might be considerably modified by constructing a series of similar impounding reservoirs at different intervals higher up the river, or where opportunity offered in the surrounding watershed, for which, according to report, the country offers unusual advantages.

Reservoir site No. 4.

About 6½ miles higher up the river I examined another basin, formed by two low spurs running from the dividing ridge of the Peel and Namoi River, which converged as they approached the latter river. A dam 30 feet high at this spot would enclose a fine flat, with steep bounding sides fully 3 miles long and half a mile wide. The converging spurs on which it would abut apparently consist of a brownish, close-grained Devonian sandstone, tilted at an angle of 30 degrees. As the rock was exposed in the water-course representing the outlet to the river, a sound foundation for a dam would probably be found right across. As no survey has been made of this valley I am unable to furnish further particulars as to its value for conserving water. Mr. Higinbotham's levels of the previous reservoir show, however, that a large portion of this basin would be included within its area, whilst, if the dam were increased in height to 85 feet, the whole of it would be covered with deep water.

Particulars of Namoi River and valley.

The average width of the bed of the Namoi River in this district is about 40 feet at bottom and 180 feet at top. It has steep banks, which vary from 15 feet to 25 feet in height. Its declivity averages 5 feet per mile. Its present discharge is estimated at 45,360,000 gallons per diem. Its highest flood-mark is about 40 feet from bed. Its bed is chiefly filled with gravel and sand, whilst its banks are composed of clay, gravel, and sand, in varying proportions according to depth. In its course to Gunnedah it intersects numerous rocky spurs, where it exposes the strata on either side. The whole country appears to have been subjected to violent igneous eruptions, as shown by the frequent dikes of porphyry and basalt,

which account for its broken character and for the numerous cross spurs and ridges. In places the sandstones and schists appear tilted at a very high angle and completely metamorphosed, whilst in other places they are soft and more evenly bedded, but rarely dip at a less angle than 20 degrees.

Turrawan waterhole.

After staying in this neighbourhood for two days I proceeded to Narrabri, to examine a large waterhole on the Namoi River in the neighbourhood of the township of Turrawan. This waterhole, or rather pine reach in the river, is very deep, is about 3¼ miles long, and has an average width of about 300 feet. The banks are steep, and are about 20 feet deep. At the upper end on the right bank there is an outcrop of hard tertiary sandstone with ferruginous bands, which has a very slight northerly dip. There is no indication of rock on the opposite bank, but about half a mile higher up a rocky sandstone spur abuts right on the left bank. At the lower end the right bank appears to be alluvial, mixed largely with gravel, whilst the left bank is formed by a shelvy beach of almost pure gravel, offering an imposing obstacle to the construction of a weir or dam; besides which, the country being higher on both banks there is no facility for an off-take.

Spring Creek basin.

Having heard of a probable site for a large reservoir at the mouth of Spring Creek, about 20 miles north of Narrabri valley, as its watercourse debouches from the mountain ridges, I spent another day in examining this locality. I found the country covered with dense scrub on both the ridges which flanked the valley, and also in the valley itself, consequently it was impossible to judge as to the capacity of the basin, or the length of dam required to impound it. Spring Creek heads in the Nandewar Range, which forms the main divide between the Namoi and Gwydir Rivers. This range takes a zigzag south-easterly course, and finally abuts on the main Cordillera, a few miles south of Uralla. After leaving the mountains the creek flows through a rich plain, which has a gradual fall towards the Namoi of about 20 feet per mile. Nearer its source it is enclosed by high rugged ridges, which rise over 1,500 feet above the plains. Two long spurs from either ridge converge at the mouth of the valley, and offer certain advantages for a dam. The valley behind opens out to a flat of some extent, but without survey it is impossible to estimate the area of the basin which would be enclosed, or the quantity of water it would conserve. I

Maule's Creek.

was informed that there was another fine site for a reservoir at Maule's Creek, about 30 miles from Narrabri, and which I recommend should be examined at some future opportunity.

Nandewar Range.

The whole aspect of the country on the southern flank of the Nandewar Range is distinctly volcanic, and, owing to the junction of strata of such widely different lithological character and age, will probably be liable to constant disturbances by earthquakes more or less severe, which will take the same course as those which upheaved the long parallel north and south ridges. In the same vicinity that tertiary rocks occur Devonian rocks crop out, greatly disturbed and crushed with faults and dislocations, caused by dikes of eruptive rocks, which constantly obtrude through them. The Nandewar Range terminates about 30 miles north-west from Narrabri, when it throws out numerous spurs in every direction. The above evidence of disturbance, together with the numerous conical shaped hills which stud the country, indicate the whole country to have been liable for ages to volcanic action and earthquakes.

I have, &c.,
FREDK. B. GIPPS, C.E.

REPORT OF THE SECRETARY ON THE "CONSERVATION OF WATER IN VICTORIA."

To the President of the Commission.

Sir,

Sydney, 5 May, 1885.

I have the honor to report that, pursuant to your direction and to the invitation of the President of the Royal Commission on Water Supply for the Colony of Victoria, I accompanied the members of that body on their recent visit to the northern districts of that colony. They expressed much regret that you were unable to be with them, and they were pleased to extend to me a very cordial welcome. I had an opportunity of seeing several important works which Water Trusts in Victoria have constructed; and, as I was privileged to attend the meetings which the Commission held in the different townships for the taking of evidence, I had a favourable opportunity of learning the views of the principal residents in the several localities visited. I am indebted to the Secretary of the Victorian Royal Commission (Mr. Stuart Murray, C.E.), and to the Acting Secretary of the Department of Water Supply (Mr. C. H. Langtree), for their prompt and obliging compliance with applications I had occasion to make to them for official information.

The average annual rainfall of Victoria for the last twenty years has not exceeded 25½ inches; but in Victoria, as in New South Wales, the rainfall is very unequal in its distribution,—in some districts exceeding 50 inches, in others being less than 10. The lightest rainfall occurs in the northern districts, and over an area of nearly one-half of the Colony the rainfall of late years has been less than 15 inches, and over a considerable portion of it less than 10. The physical conditions of this area in other respects also very much resemble those of the level country in New South Wales which falls from the western slopes of the Main Dividing Range to the Murray and the Darling.

The Victorian Land Act of 1869, which provided for an extension of the area which could be taken up by free selection, and which gave other facilities for the acquisition of land from the Crown which had not before existed, coupled with the heavy rainfall of 1870 and 1875, appear to be the principal causes which led to the occupation of the northern and north-eastern districts by an agricultural population. The floods of 1870 and 1875 produced a luxuriant growth of herbage and abundant crops in the succeeding seasons, but the continuance of dry seasons from 1878 to the present time has changed the prosperous conditions of settlement in those districts, and the people have had to wage a severe struggle for bare existence. Some have had to succumb under the pressure of successive droughts, and nearly all have been reduced to the direst straits to obtain water for their stock and for ordinary domestic purposes. In some of the localities which I visited the farmers have had to drive their stock 15 and 20 miles to water, and it was no uncommon thing for the few muddy sources of supply to be besieged as late as 3 o'clock in the morning by farmers who had come long distances and had to wait their turn for many hours. In other places the inhabitants were almost wholly dependent on the water trains which the Government despatched from Sandhurst for the relief of their most pressing necessities.

Severe

Severe privations such as these quickened the perceptions of the people as to the need of permanent water supply. While the country was under pastoral occupation a large amount of capital was expended in making provision for the storage of water, and as population thickened the Shire Councils devoted a very large part of their revenues to a similar purpose. Anything which could be done in this way, however, was felt to be desultory and inadequate to the requirements of the case. Schemes of general application were felt to be indispensable, and Messrs. Gordon and Black were called upon by the Government to report as to what could be done at a reasonable expense to obtain a supply of water to the northern plains—in the first place for domestic purposes and for the use of stock, and in the next for irrigation. They pushed forward their inquiries with all practicable speed, and in the years 1880 and 1881 they were in a position to advise the Government as to what was best to be done. They arrived at the conclusion that the yearly discharge of the rivers flowing northwards into the Murray, combined with the local rainfall, would be far more than was sufficient to meet the requirements of the settlers for stock and domestic purposes, if the winter rains were stored by a system of local works and made available for distribution during the dry period of the year, and at the same time such works could be made to form an integral part of any system of irrigation which might be found practicable, having regard to the capacity of storage and the cost of distribution. The general results of their proposals were thus summarized by them in their last report to the Minister:—

Having now completed our report on the first part of the inquiry with which we were charged, we have arranged in a tabular form the information contained in the reports and the results of the approximate estimates.

It will be seen that the total area proposed to be supplied with water for stock and domestic use under the different schemes (excluding Huntly, No. X, which is a minor work) is about 8,560 square miles, or nearly 5½ million acres, and that the population settled on this area, as nearly as we have been able to ascertain it, with the kind assistance of the Government Statist, is 54,493. This population varies in density from 2·75 to 8·1 per square mile, the average being 6·8. The estimated cost of the proposed works, exclusive of the purchase of land, varies from £18 2s. to £55 4s. 9d. in the different schemes, the average being £29 16s. 10d. per square mile of country, and the annual cost of interest and management from ½d. to 1½d., the average being under ¾d. per acre. Assuming the average numbers of a household to be four and a half, the annual cost per household will vary from 18s. 3d. (in the Wimmera) to £2 17s. 4d. (in the Gunbower scheme), the average being £1 6s. 2d. Assuming that an acre of land will yield 12 bushels of wheat, or support one sheep, and that the annual net profit per acre is respectively 12s. and 10s., or an average of 11s., as statistics seem to show, then this average annual cost will be equal to nearly the annual value of 2¼ acres; and as each household has on an average 434 acres, the annual cost would, on these data, amount to the yield of about half an acre in every hundred acres.

Most of the schemes propounded have been taken in hand by local bodies, and some of them are far advanced to completion. I purpose briefly referring in detail to the more important schemes, because, as it appears to me, they contain features of great value to New South Wales. Before I do so, however, it is desirable that I should invite your attention to some of the principal provisions of the law of Victoria on the conservation and supply of water, which has given scope and protection to the great works upon which energetic and self-reliant communities in Victoria were not slow to enter when with quick intelligence they perceived, from Messrs. Gordon and Black's reports, the lines upon which they could safely proceed. In the present condition of our laws, or rather the want of law applicable to our circumstances, and the total absence of local governing bodies, it is not conceivable how any schemes for the conservation and distribution of water over large areas of country can be initiated or carried out, or, if undertaken, how they can be protected and maintained; and if I am correct in this view, it seems to me that the provisions of the Victorian Statutes applicable to country which is almost identical in formation and level with the larger part of New South Wales must have deep interest to us. The Victorian Statutes bearing upon the subject are named in the margin. Copies have been obtained.

44 Vic. No. 688
45 Vic. No. 716
47 Vic. No. 778.
48 Vic. No. 829.

The Act under which the present Water Trusts were called into existence was brought forward in the Parliament of Victoria by the Hon. Charles Young, then Minister for Water Supply, and he still takes a very lively and intelligent interest in the question. Victoria has for many years enjoyed the advantages of local self-government; and, of its total area (87,884 square miles), 83,211 square miles are under the control of local municipal bodies, designated in one class of cases as cities, towns, and boroughs, and in the other as shires. The system has many advantages as compared with that under which roads, bridges, and other public improvements are devised and executed by central authorities and paid for directly from the general revenue. It is obvious that ratepayers, knowing that they must provide a large part of the cost of any work for the improvement of their district, if not indeed, in many cases, the whole of it, are careful to enter upon such works only as are of public utility; and—having an immediate interest in the efficient and economical construction of the works—the ratepayers may be regarded in the light of a body of unpaid inspectors, whose constant vigilance is calculated to exercise a check upon extravagance and to create a healthy public opinion inimical to jobbery, while at the same time it tends to ensure an equitable distribution of the funds for shire improvements. In all probability there are cases in which the action of Shire Councils gives rise to complaints of partiality, pretty much as in municipalities of more restricted character in New South Wales. An alderman is sometimes popularly supposed to provide for improvements against his own door; but it by no means follows that such complaints are well founded; and even if they were, they are an evil small in comparison with the dilatoriness and expensiveness of what is known as centralization. The annual endowment by Government to the local governing bodies in Victoria is £310,000, but their total revenues amounted in the year 1883–4 to £1,086,502.

Mr. Young, in framing his Bill (45 Vic. 716) "for the Conservation and Distribution of Water throughout Victoria," took advantage of the organization which he found in healthy operation under the Local Government Act, and he sought to induce the Shires of different districts to co-operate in undertaking the duty of providing for their united requirements. The Water Trusts which were thereby brought into existence were constituted on the principle of Shire Councils, with only such modifications as seemed necessary to meet the new and larger functions they were called upon to exercise. The principle of local taxation for local benefits by works carried out under local supervision runs through all the statutes bearing on water conservation. The fact, however, that the Water Trusts would have entrusted to them the expenditure of Government loans, in some cases amounting to nearly £100,000, was probably the reason why it was determined that one Commissioner on each Trust should be appointed and removable by the Government, while the others were elected from among their own number by the members of the Shire Councils brought into co-operation. Section 2 empowers the Council of one or more municipal districts, singly or acting together, to prepare plans and descriptions of such waterworks as they desire for their districts; and if these are favourably reported on by professional men employed by the Minister, the Governor in Council may approve of or modify them in such manner as, upon further investigation, and

after

after the interests supposed to be in conflict with the scheme of the promoters have been expressed, may be judged expedient. The approval of the works and the constitution of the Trust is legally effected by an Order in Council, which must state—

(*a*) The amount of money which the Governor in Council will grant as a loan for the purpose of carrying out the same and paying the cost and expense of the plans and application for the same, and also the rate of interest which will be charged for such loan, such rate being at least one-half per centum more than the rate payable by the Government on the public loan out of which such loan may be granted;
(*b*) Shall proclaim the limits of the lands—whether within or without the municipal districts of the Council or Councils applying for the proposed waterworks—within which such Trust shall have authority to be called a Waterworks District;
(*c*) Shall state what are the principal works proposed to be constructed; and
(*d*) Shall contain such provisions (not inconsistent with this Act) as, according to the nature of the application and the facts and circumstances of each case, the Governor in Council shall think fit.

As a matter of fact, the plans which the Water Trusts have been formed to carry out are in the main those which were prepared at the instance of the Government, by Messrs. Gordon and Black. The Government, while no doubt they rendered a very substantial service to the districts interested by procuring the plans, are in no way responsible for them: they treat them as the plans of the parties applying for the Trust. The examination to which they subject them is to satisfy themselves as to the stability of the projects upon which they are asked to lend money, and they cannot be supposed to accept anything in the nature of a partnership liability. If the plans and estimates upon which a loan was procured were subsequently found wholly fallacious, and if it should happen that a Trust had squandered the loan upon works which turned out to be worthless, the Trust would not be able to evade their responsibility for the repayment of the loan, on the ground that the Government had approved of the plans. The Local Government Act of Victoria makes provision for the examination of municipal surveyors and engineers and the issue of certificates of competency. I am informed that the examining Board are very stringent in their requirements; and it is very probable therefore that the Shire Councils of Victoria have at their command an amount of highly skilled professional assistance which but for this circumstance would not be available. The relation of the Government to the Trusts is that of mortgagee and mortgagor. There are several sections in the Acts which provide for the supervision of the principal works—one which forbids the acceptance of a tender for the principal works until the terms of contract have been approved by the Governor in Council; another which enables the Government to require the Trust to dismiss their Engineer; another which provides that, if the Minister so requires, the municipal works shall be carried out under the supervision of an officer appointed by the Government, the certificate of which officer may be made necessary before any portion of the cost of the works becomes chargeable against the loan. Another section provides for the annual audit of the accounts of the Trust by a Government Auditor, all this being in addition to the direct representation which the Government have upon the Trust. The constitution of a Trust is provided for in section 18 (No. 716) as follows:—

Each Waterworks Trust shall consist of Commissioners to be elected from time to time by the Council of each of the municipal districts which will, in the opinion of the Governor in Council, be directly benefited by the proposed waterworks, and which shall be specified in the Order in Council approving the construction of such waterworks or in any subsequent Order, and of one other Commissioner who shall be appointed by the Governor in Council; and the number of Commissioners to be elected by each Council, not exceeding two, shall be determined by the Governor in Council.

Every such Commissioner so elected or appointed the Governor in Council may remove from office, but no elected Commissioner shall be removed from office except on the application of the Council by which he was elected.

The scrutiny of the plans, &c., by an independent authority at the instance of Government, and the provisions made for Governmental interference at subsequent stages, were no doubt primarily intended for the protection of the interests of the Colony which provides the loan; and, if the scrutiny be sound and thorough, it must incidentally be of even greater benefit to the district more immediately concerned. From statements which I have heard in different quarters, I am led to think that there is very great danger lest these provisions—however excellent they may be theoretically—should be allowed to fall into disuse, or that the supervision for which they provide should become perfunctory and valueless. I am not aware that any defect so serious has been disclosed in the working of the Acts; but it should be remembered that they have been in existence for only a very short time; and the limited experience gained is by no means conclusive against the inference which I draw from the fact that the Government have not in their service any officer whom they can hold responsible for the advice upon which they act in the approval of plans and the constitution of Water Trusts. The Government are in a position analogous to that in which our own Government would be placed if, in the various cases they have to litigate, they had no Crown Solicitor or Attorney-General to advise them, but had to depend upon the casual services of the legal profession. It is possible—at least so I have been informed, on what I take to be trustworthy authority—for an engineer to devise a plan of waterworks upon which a district proposes to obtain a Government loan, to be called in by the Government to advise them, and he may also be afterwards engaged by the Shire to carry out the works: that is to say, at different periods of the negotiation he can act for the Trust and the Government—for the mortgagor and the mortgagee. The principle of self-government is one of such inestimable value, and the sacrifice which Shire Councillors make of their time and personal comfort to enable them to render voluntary service to the general public is so great, that Governments may be expected to deal with such bodies as Water Trusts in a generous, confiding spirit; but inasmuch as the futures of a "dry" district will depend upon the stability and success of the waterworks constructed, to say nothing of the ability of the ratepayers to repay the loan to the general public, it does seem of first importance that the examination of the schemes submittted for Government approval shall be of the most searching character, and be undertaken by the best engineers in the Government Service. While the works are under construction, also, there should be a periodical inspection by competent officers, whose responsibilities should be solely to the Government. A very small staff would suffice for examining and inspecting purposes. The business would be likely to be better done, and on principles uniform in their application, as compared with the diversity which might be expected from the employment of a large number of non-official experts, paid by fees. A small staff would probably enable the Government to dispense with the provision for special representation in the membership of the Trust. While it might be taken to imply a doubt as to the capacity of the representative constituents of the Trust, the nominee element would not, in most country places, give any better security to Government than that which they would obtain by means of their

their Engineers and Auditors. It may be feared that appointments of this character might be sought after by persons who covet distinction in particular localities, and that the Government would find insuperable difficulty in discovering those best qualified to act.

As to the general powers of the Trusts, they are so varied and important that I prefer to quote the definition contained in the Act itself (section 38 of 45 Vic. No. 716), rather than to attempt any generalization of my own. It reads thus :—

For the purposes of this Act any Waterworks Trust by its officers or servants may subject to the provisions and restrictions herein contained and in accordance with plans approved by the Governor in Council as aforesaid exercise any of the following powers (that is to say) :—

It may enter upon any lands described in the plans and take the levels of the same and set out such parts thereof as it thinks necessary and dig and break up the soil of such lands or trench the same and remove or use all earth stones trees or other things dug or gotten out of the same.

It may enter upon take possession of and appropriate such land as shall be necessary for the construction or improvement of the works or for securing or improving the water to be supplied or the quality or purity thereof.

It may purchase or lease any existing waterworks and erect or construct all necessary waterwheels hydraulic engines and pumping or any other machinery.

It may from time to time sink wells or shafts and make maintain alter or discontinue reservoirs waterworks cisterns tanks aqueducts drains cuts sluices pipes culverts engines and other works and erect buildings upon the lands and streams authorized to be taken by or vested in it.

It may from time to time divert water from any lake lagoon swamp marsh river creek or watercourse to the extent specified in the authorized plan and descriptions of the waterworks.

It may from time to time divert or alter as well temporarily as permanently any part of the course of any rivers creeks or watercourses roads streets or ways in order the more conveniently to carry out any of the powers conferred on the Trusts.

It may construct weirs and dams in any river creek or watercourse.

It may cut drains and deliver water into or take water from and embank widen or deepen any river creek watercourse lake lagoon swamp or marsh.

It may at any time enter upon any lands roads or streets for the purpose of repairing or altering any watercourses and other works under the control of the Trust or in any way connected with such works.

The Water Trusts and local municipal bodies have powers similar to those reserved to the Government of this Colony under which they may enter upon lands to obtain timber and materials for road-making, but they wisely abstain from the exercise of them unless necessity arises in very exceptional cases. As a general rule all work is done by contract, and the contractor is left to his own resources in providing materials, quite as much so as a builder in providing bricks. Water Trusts, however, are compelled to enter upon and make watercourses through private property, and the law provides for compensation to the owner in the form of "easement" privileges over lands required for channels and other works, "such lands not being the site or curtilage of any house or garden, yard, court, plantation, planted walk, avenue, or nursery for trees." The compensation to be paid for the easement may be either as a gross sum or a yearly rent, as agreed upon by the parties or as may be determined under the Lands Compensation Statute. The question of compensation is one which ought to be well considered in any legislation on the subject, so as to protect individuals from oppression on the one hand and the general public from extortion on the other. The bulk of the channels will be for subsidiary distribution, not more than two yards wide. None that I saw were fenced in, but provision was made by substantial bridges for stock to cross from one part of a paddock to another, and suitable slopes are also made at which the stock can drink. The right of "easement" includes the channel and the "spoil," which is thrown a yard or two away on the lower side, and soon forms a neat grassy ledge along the line of the drains. Provision is also made on the lower side at regular intervals, to the extent of 300 feet per mile, for the escape of storm-waters in the event of the conduits being filled. These channels already number many hundred miles in length ; and owners who are disposed to put a fancy valuation upon their property will try to drive hard bargains. The "easement" right over the bulk of the property which I saw had been settled at £3 an acre, but there were those who were holding out for £10. It is extremely questionable whether in nine cases out of ten any compensation ought to be given for carrying a running stream of water through what would otherwise be waterless country—the increased value given to the land being greater than any loss of pasturage. In ordinary cases compensation may form an important item in the cost of works; and I am disposed to suggest that no compensation ought to be given to any man who cannot show that he has, by the expenditure of his own money in water supply, taken all necessary precautions to keep his stock alive. The works of the Trusts are exempted from municipal taxation.

The financial aspect of the question is one to which, doubtless, you will attach importance. The tanks and wells constructed by the Government of New South Wales have been chiefly meant to facilitate the travelling stock, and in a few instances they have also been available for the supply of small townships. The expenditure (£210,000) as a whole, however, may be regarded very much in the light of a subsidy to the pastoral interest, and as being purely eleemosynary ; for while the revenue derived as rent for the leasing of the watering-places amounts to £400 per annum, the yearly cost of supervision, as distinct from maintenance, amounts to nearly £5,000. Victoria being well supplied with railways, all the stock from long distances for Melbourne are trucked. It will have been inferred, from what I have already written, that the principle upon which Parliament has proceeded in Victoria is, that each district shall pay for its own improvement—water conservation being no exception to the rule. It is true that, in addition to the £400,000 loan raised for the purpose of being lent to the Water Trusts, the Legislature has appropriated £100,000 as a free grant. Of this sum £91,000 has been allotted, but the rule which governs its distribution is based upon the readiness of the inhabitants to tax themselves, as shown by the magnitude of the works they undertake. The particulars of the disbursement of the loan and of the grant will be found in the return (*Appendix A*) which the Acting Secretary of the Water Supply Department has been good enough to prepare for me. The £100,000 was granted as an encouragement to the inhabitants of particular districts to assume the heavy responsibilities which it was seen that any large scheme of water supply must involve ; but, unlike the endowment to the municipal bodies, it is a final and not an annual subsidy.

The law empowers any Trust to which the Government have granted a loan for the construction of waterworks to levy upon all lands and tenements situate within the district supplied "for all or any of the purposes of

(*a*) Paying interest on such loan ;

(*b*) Maintaining such waterworks in an efficient state ; or

(*c*) Extending the waterworks as the Governor in Council may authorize." (Sec. 53, No. 716.)

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The late Act (47 Vic. No. 778, sec. 97) provides that the rate shall not be levied until notice has been given in the Government Gazette that the district, or part of the district as the case may be, is supplied with water under the provisions of the Act. The municipal valuation is to be taken as the basis of assessment (sec. 57, No. 716), and no rate shall exceed 10 per cent. per annum on the annual valuation of the property (sec. 54, No. 716). The rates may be recovered summarily before any two Justices; and, in the case of any property in a water supply district being unoccupied, and the rates accruing thereon being unpaid for a period of five years, the Trust may take possession of it and hold it as against any person interested, and may from time to time grant leases of the property (sec. 61, No. 716).

The interest which the Government charge the Water Trust is one-half per cent. higher than that at which they negotiate the loan, which—making allowance for the cost of floating the loan, exchange, and the time before interest becomes payable by the Trusts—is practically the price which the Government themselves pay for the use of the money. The last loan was raised at 4 per cent.—a much lower rate than the Trusts could expect to obtain if they borrowed the money direct. The Act 47 Vic. No. 778 provides that the aggregate amount which can be borrowed by a Trust shall not at any time exceed 70 per cent. of the value of the land within the area of the Trust (sec. 30); and if a Trust borrows money on the credit of the area which the Trust is not legally bound to pay, then all the Commissioners of the Trust who have consented to the borrowing are made jointly and severally liable to pay the amount (sec. 57, No. 778). The proviso to section 91 of the same Act sets an important limit to the borrowing powers of the Trust, with a view to protect the ratepayers from exorbitant taxation. It is in these words:—

> Provided that the amount of any such additional loan granted under the provisions of this Act to any Waterworks Trust shall be such that the sum of the yearly interest payable thereon and of the yearly interest payable on any other loan granted by the Governor in Council to such Waterworks Trust shall not exceed the amount which can be raised in any year by a rate of one shilling and sixpence in the pound upon the ratable property within the waterworks district of such Waterworks Trust.

The quotation which I have made from the principal Act (No. 716, sec. 53) indicates that the payment of interest is to be one of the objects to which the rates shall be applied; but there is nothing in the section to make it a first charge, or to prevent a Trust from applying £99 out of the £100 to the maintenance and extension of the works, leaving the payment of interest postponed indefinitely. Under the 51st section, it would be competent for the Board of Land and Works, when accepting the mortgage which the Trusts execute for the repayment of their loans, to make such a contract in regard to the disposal of the rates as the Board may deem advisable. The Amending Act of 1883 (47 Vic. No. 778) contains explicit provisions as to the payment of interest and principal. Thus, for example, section 46 enacts that every Trust shall from time to time make and levy such rates as are sufficient to pay the interest due upon any loan obtained by the Trust under the Act, and to provide for the necessary annual payments for the sinking fund of such loan, and also for all current expenses incurred by the Trust in the control and management of the area over which their powers extend. The sinking fund mentioned in this section is a very important supplement to the legislation of 1881. The extent and operation of it are set forth in the three following sections (115, 116, 117, of No. 778).

> 115. When any Waterworks or Irrigation Trust has obtained a loan under the provisions of this or the Principal Act, a sinking fund shall be formed to liquidate the same in the manner following:—
>
> Such Waterworks or Irrigation Trust shall after the levying of its first rate cause a sum being such percentage of the principal sum of such loan as may be agreed upon between such Trust and the Governor in Council not being at any time less than one pound ten shillings per centum of such principal sum to be in every year after the date of the granting of such loan and until the complete liquidation thereof or until the Commissioners of Audit or any two of them by writing under their hands certify that the amount of the sinking fund formed hereunder is sufficient to secure the liquidation of such loan invested in the purchase of Victorian Government stock which stock shall be placed in the stock ledgers in the names of the Treasurer of Victoria and of such Waterworks Trust as aforesaid to an account entitled as of such loan. Provided that in all cases in which Trusts cannot secure Government stock at par the Trust shall pay into the account of the Treasurer of Victoria and such Trust the money percentage hereinbefore directed to be invested in Government stock and all such moneys shall carry interest not being at any time more than four pounds per centum per annum and such interest shall be placed to the credit of the sinking fund in the same way as provided for interest accruing on Government stock.
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> 116. All interest accruing due on any stock or moneys for the time being standing to the credit of any account forming any sinking fund shall be invested in the purchase of Victorian Government stock or moneys which shall be placed to the credit of the same account.
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> 117. As soon as conveniently may be after the amount of any sinking fund shall have increased to such sum as shall be sufficient to secure the liquidation of the loan in respect of which such sinking fund was formed the Victorian Government stock placed to the credit of the account entitled as of that loan shall be sold out and the proceeds thereof shall be applied in the first place to the redemption of such loan and thereafter to such purposes as the Waterworks or Irrigation Trust which invested the same directs.

There is one other provision in the law of Victoria bearing upon this part of the subject to which I must draw your attention. I refer to the 4th section of the Act of 1884 (48 Vic. No. 829), which provides that the Governor in Council may, if in his opinion there be sufficient reason therefor, notwithstanding the provisions of the Acts of 1881 and 1883, or of anything contained in any mortgage made under the authority of these Acts, "direct that interest on any moneys secured by any such mortgage shall be charged from a day not more than two years subsequent to the day in that behalf specified in such mortgage." I am not aware of the reason which led to this amendment of the law; but considering the magnitude of the works to be constructed—that experience in the construction of such works in Australia is as yet very limited—that there are often great fluctuations in the supply of labour, and occasionally great vicissitudes in the amount of the rainfall—it will probably be acknowledged that there must have been strong grounds to recommend such a modification of the original contracts. Whether it is advisable to give to the Executive authority power to postpone the day of payment in one district and to refuse the like concession to another appears to be a question of expediency; and the assumption that a Government will exhibit partiality in the exercise of the discretion vested in them may not be more creditable to those who make it than to those assailed by it. In the absence of some such flexible provision as this, the alternative of a rigid insistence upon punctual payment might entail great hardship.

In the contingency of ratepayers or Councils failing to elect Commissioners to the Trust, the Governor in Council has power to constitute the body by appointing them (sec. 21, No. 716); and should a Trust fail to meet their financial obligations to the Government, the law empowers the Board of Land and Works (which acts for the Government in its relations to the Trusts) to take possession of the works and to levy the rates. The sections bearing upon this point are 52 of No. 716, and 46 of No. 778.

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The question naturally arises as to the disposition of the people to pay interest on the loans. It should be borne in mind that the Trusts are of recent formation, and that in only two or three of them have the works been completed sufficiently long to admit of a rate being struck. I am informed that the Wimmera Trust, whose expenditure has exceeded £95,000, has struck a rate, and that other two Trusts whose works are on the point of completion are about to do so. It would probably be somewhat remarkable if the people did not regard the Government as a lenient creditor; and in different localities through which I have passed I have heard views expressed which appeared to me to savour of repudiation; but when the idea has been nakedly put to a witness in so many words, repudiation itself has been disclaimed. In one case where a witness was avowing views such as I have expressed, and condemning the levying of a rate, the audience in the Court-house instantly and with much warmth expressed their strong dissent. It must be extremely difficult for a visitor passing through a community to know precisely what weight attaches to the opinions of persons whom he meets in the briefest possible way; and if I had had longer opportunities for gaining information, I should still greatly distrust my ability to form a correct judgment. If the question was one which merely concerned the honesty of our neighbours, I should feel myself chargeable with presumption in referring to it; but, because I think it not improbable that the Government of New South Wales may be led to act on lines similar to those on which Victoria has proceeded, I feel bound to suggest your consideration of the subject purely as an abstract question. Just now, when the residents of the northern areas of Victoria are still painfully sensible of the sufferings and loss entailed upon them by five or six years' drought, they readily acknowledge the immense benefits which a permanent supply of water will confer on them; but after the lapse of a cycle of wet years, during which their crops might be destroyed by superabundant moisture and some of their waterworks swept away by floods, they might be less disinclined to listen to those who make large bids for popularity by counselling repudiation than they are at present. Dropping the question of honesty, I will not asperse the intelligence of the majority of the ratepayers by supposing that they would not be quick to perceive that a policy of repudiation would be more disastrous in retarding permanent settlement than the effects of the most desolating drought; but it does occur to me that the provision made by the law of 1883 for the repayment every year of a portion of the debt is one wholly in the interests of good government and sound morality. If, unfortunately, it should ever happen that one Trust should be led to try and shuffle out of its obligations, all the other Trusts who had steadily paid their interest and contributions to the sinking fund would form a strong make-weight with the rest of the community in strengthening the hands of any Minister whose duty it would be to insist upon payments due to the State by debtors whose suffrages he might have to seek.

Works of the magnitude of some of those which I have seen are calculated to evoke the liveliest admiration for the communities who have had the courage to undertake them and the energy and skill to push them on to such rapid completion, more particularly when it is obvious that the pressure of taxation must be great. It requires but little foresight, however, to perceive that present self-denial in the intelligent pursuit of their own immediate welfare must be followed by the most beneficent and splendid results to the Colony as a whole. The arid plains of northern Victoria are without doubt destined to become well watered, and much of them as fruitful as a garden. As the railways of Belgium have paid for themselves and become a source of great wealth to its people, vivifying production and giving value to the smallest articles before not worth the cost of carriage, so it may be expected that the Water and Irrigation Trusts of Victoria, having extinguished their debts by the annual payment of one and a half per cent., will become most valuable properties to the districts which have had the enterprise to construct them, and coming generations will enter upon a goodly heritage.

A feature of Victorian legislation upon this subject which strikes me as very admirable is the adaptability of its provisions to any area, say a combination of municipal districts, a single shire, a riding (which is a division of a shire), or a town, so that none are excluded from the benefits of Government help to united effort to obtain water supply, and none are included in the area of taxation whom that supply does not in one form or other benefit. (Sections 67, 79, 80, 94 of 47 Vic. No. 778.) The constitution of the several kinds of Trusts are the same in principle, and there are provisions under which individuals other than ratepayers may combine to acquire the right to conserve and distribute water, but their powers are more restricted than those conferred upon representative bodies. Waterworks districts may also be provided, and differential rates levied according to the extent of the advantage conferred. The law appears to be designed to confer substantial equity upon all—however varied the physical condition of the country embraced in the Trust—however abundant or scarce the natural supply of water in the different localities may be. I say substantial equity, because I suppose absolute equality is a thing unattainable in dealing with so many interests as are involved in any large tract of country. The man fortunate enough to own land whose configuration readily admits of the storage of water, and provident enough to construct the dams or tanks necessary to supply his wants, may object to pay taxes for works designed to benefit the majority who are less fortunate or less thrifty, pretty much in the same way as many residents in the western suburbs of Sydney, having provided themselves with abundant storage for water, might object to pay rates for the Nepean supply when it shall be brought through their boroughs on its course to Sydney. Such cases may have the appearance of hardship if the certain tendency of water supply to increase the general value of property be ignored.

The Trusts can, if they choose, arrange with the municipal bodies to collect their rates for them, but the presumption is that in most cases this dual form of local government will entail the employment of two staffs—an engineer and secretary for water purposes, a surveyor and clerk for road purposes. If there be any value in the suggestion which I have made in a previous paragraph, that special representation of the Government on the Trust might be dispensed with by a thorough examination of plans in the first instance and periodical inspection during the construction of the principal works, it might be found desirable by the Government of this Colony, in any proposed legislation on the subject of local government, to relegate the business of conserving water to them, and thus obviate duplicating the machinery of government by the creation of special Trusts. In that view of the case, it would probably be found expedient and quite practicable in the level country to determine the boundaries of municipal districts by the lines of their natural drainage areas. I assume that on the western plains the conservation and distribution of water is of paramount importance. The country being destitute of road-making material must depend upon railways, which are not regarded as local works, and as the traffic chiefly occurs in the dry time of the year the surface of the soil is sufficiently hard to bear traction.

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The necessity for schemes of water conservation is no doubt common to all the Colonies of Australia; but, as it appears to me, there are special reasons which make the need more urgent in New South Wales than in Victoria. In the latter Colony frontages to creeks and rivers, a mile wide on either side, are reserved by the Government, so that whatever water may be found in the natural channels is accessible to the general public quite as much as to the lessee. In New South Wales these frontages and the natural water-holes have to a very great extent been alienated to private individuals, with the consequence that the lands adjacent thereto must almost of necessity pass by lease or otherwise into the hands of the pastoralist who has acquired a monopoly of the water. I presume it cannot be expected that the Government will advance money to private individuals, or permit them to intercept the flow of water in creeks and rivers; and that therefore any schemes for the conservation of water will have to be carried out by municipal bodies. Inasmuch, however, as the Crown is still the owner of immense areas of land, care should be taken, in the examination of any scheme submitted for their approval, to see that it was so designed to benefit the largest possible area, and that the whole of an available supply of water should not be monopolized by a comparatively few persons. It cannot be expected that municipal bodies would take water through unoccupied Crown Lands from which they could expect to derive no revenue; but their schemes ought to be so devised that they should be capable of commanding such areas if the natural features of the country permitted of that being done. The effect of such schemes must be to break up any existing monopolies of water, by the multiplication to the extent of many hundreds (I will even hope thousands) of miles of water frontage, and that the value of the public estate will be correspondingly increased thereby. In this view of the matter, Government will be fully compensated for such moderate grants as it may be in their power to make by way of supplement to their loans to local bodies; but I suggest that it would not be expedient to allow district municipal bodies to levy a water-rate upon *unoccupied* Crown Lands, for it is conceivable that cases might occur in which such bodies might so use their powers as to throw the burden of taxation from their own shoulders on to those of the general public. In all probability, where water is caused to flow through unoccupied land, occupation will almost immediately follow, and the taxable area will be thereby increased. The rating powers of Water Trusts in Victoria are, as I have stated, based on the municipal assessment; and if Crown Lands in private occupation are rated by any municipality, a Water Works Trust has also the power to levy rates.

It seems to be a characteristic of all the rivers flowing through the level districts to form banks higher than most of the country which they drain; and as in Victoria so also in New South Wales, there are numerous effluent creeks which draw off the flood-waters from the main streams. Inspection of the works carried out in Victoria will demonstrate the soundness of the views which, if I mistake not, you have long since formed that, by the construction of weirs at suitable points across the main streams, much of the flood-water which is now lost in the soil or which flows on to the sea might be thrown back into these effluent creeks, such as the Yanko, Colombo, and the Billabong, so that for a comparatively small outlay for head works in improving and defining the channels, hundreds of miles of natural storage might in flood years be utilized.

"Riparian rights" are, I believe, held to be an insuperable obstacle to water conservation in many districts, in the present state of the law. May I suggest for your consideration that the vesting of the control of watercourses in the hands of Trusts or District Municipal Councillors, elected by the owners of property whose interests are concerned, would be a fairly satisfactory solution of the difficulty in New South Wales, as it appears to me to have been in Victoria. I assume that here as there the Government would exercise the right of defining boundaries after the fullest publicity had been given to all proceedings and a careful scrutiny of the projects submitted for their approval. If it were proposed to vest the power of determining boundaries and granting charters in the larger authority of Parliament, I should fear that, in the absence of any machinery by which conflicting interests could be reconciled, the expense, delay, and difficulty of obtaining special Acts of Parliament would be so great as to amount to a prohibition to the adoption of large schemes for water conservation. It is by no means improbable, although I heard only one complaint, which was afterwards shown to be grounded on wrong information, that the residents of one locality included in the area of a Water Trust do not receive the same amount of benefit as do others; but it is necessary that I should point out that the works of the Trusts were constructed with a view to equalize the benefits of water conservation as widely as possible. Weirs which impound water at the heads of the streams are provided with compensation sluices through which a certain regulated quantity of water is allowed to flow to the people living lower down the stream. These, in the present development of water conservation, cannot have the same abundant supply as those living above the weir; yet if it were not for the weir they would have no supply at all—they would be left to the full enjoyment of their "riparian rights," that is to say, the privilege of contemplating an empty creek, the dryness of whose bed would absorb a large proportion of even a very copious rainfall. It seems to be only a question of time when, by the multiplication of weirs, everybody will be almost equally fortunate.

Another point in the construction of weirs in Victoria ought not to escape attention; and that is the great length of their wings. The soil of the plains is of so fine a texture that it may be said to almost dissolve under the action of water; and a very slight obstruction has often turned the course of what in flood-time is a large river. A weir which would merely extend from bank to bank would be swept away, or it would divert the flow of the river into some new channel. This danger appears to be fully recognized and successfully combated by making the crest of the weir of such a width and elevation as will permit of the even flow upon the aprons below of any flood discharges which cannot be impounded, and by carrying out the wings of the structure to whatever distance may be necessary to annihilate the scour. The designs for the weir which it is proposed to construct across the Goulburn shows a total length of 1,663 feet. Everything depends upon the stability of these structures; and no care which can be exercised appears to have been omitted in the construction of those which the Commissioners examined. The cost of them, however, does not appear to be larger than the resources of the district can meet—a result chiefly attributable to local control.

The distributing channels often intersect the public roads, and form watering-places for stock on each side of the bridge which carries the roadway over the middle of them. The channels at these points are pitched with blue-stone cubes. As there is no stone in the soil, the excavation of these channels is very cheaply made by means of horse ploughs and scoops. The work is mostly done by farmers living in the district. The price paid for the excavation of the smaller drains and depositing the soil a yard or two

away

away from the edge was 7d. and 7½d. per cubic yard. At the Waranga basin, where one side of the lake is being enclosed by a bank, on the top of which a water conduit is to be made, the cost of doing the following work was only 1s. per cubic yard of stuff in the bank:—Ploughing the surface upon which the bank was to be built, excavating soil for bank and carting it a distance of 2 chains, rolling the clay every 4 inches, so as to consolidate and practically make it into a puddled wall. The length of this bank, which is far advanced in construction, is two miles and a half, width across the top 25 feet, side slopes 2 to 1, and average height 12 feet. The price of 1s. a cube yard also includes the excavation of the conduit which will be formed in the top of the bank, and the proper disposal of the spoil. Here also horse-scoops and ploughs were the only excavating machinery employed.*

I see from Mr. Hayter's Victorian Year Book that there are forty-three towns and three shires supplied with water, inclusive of Melbourne and its suburbs, whose population, numbering about 300,000 souls, have an abundant supply at high pressure. There are several other towns which have completed their works since that return was compiled (1883–4), and it is not brought down to a date sufficiently late to include all the Trust Works to which this memorandum has almost exclusive reference. It may not be out of place, however, to mention that the storage capacity of the reservoirs included in Mr. Hayter's return is stated as being 13,202,483,932 gallons, and the cost of the works, actual or estimated, as being £3,877,485. As it may not be deemed to be within the scope of your inquiries to institute any comparison between what has been done in this direction in Victoria with what has been projected here, I purpose to abstain from writing out much of the information placed at my disposal, although I may be permitted a passing allusion to what is known as the Coliban scheme, which, though financially among the least remunerative, has nevertheless been productive of immense advantages in other respects. The water impounded in the reservoir at Malmsbury flows for a distance of 100 miles to Sandhurst, supplying several small towns on the way; and by its agency Sandhurst, which was a place perfectly hideous in its desolation, probably without a parallel in its bad pre-eminence, has become one of the most attractive and healthful towns in Victoria. It has a fine sheet of water for boating, its streets are adorned by avenues of lofty trees, whose leafy beauty is the pride of its citizens, if not indeed of the people of Victoria. This city of 30,000 souls is indebted to its water supply for an incalculable amount of comfort and prosperity, and in large measure for its continued existence. The most instructive feature in regard to town supplies seems to me to belong to those towns which have provided for their own requirements by means of loans advanced to them under the "urban" sections of the Water Conservation Acts. I may mention Echuca (population, 4,800) and Kerang (population, 400) as specimens of several others which offer a fine example to a large number of towns in New South Wales, which, having rivers flowing at their feet, could easily erect the pumping machinery and water towers necessary to supply the inhabitants by a system of reticulation; and as an example of what may be done by towns farther removed from flowing water, I may mention Kyneton (population 3,300), which, at a cost of £25,000, including the reticulation, brings its supply through pipes from storage reservoirs at a distance of 9 miles, and which, by a 1s. rate, pays both interest and sinking funds. Here, as I believe is the case generally, the water rate covers the domestic supply; but all supplies to manufactories, brewers, livery stables, and gardens, are paid for by meter.

The desire to obtain water sufficient for irrigation is very strong in the northern districts of Victoria; indeed I think I should be justified in saying that the people are becoming clamorous on the subject, so satisfied are they that wet cultivation can be carried on with results far more profitable than dry. The subject was pressed upon the attention of the Commissioners in every township and by several witnesses. This is a point upon which I have taken rather full notes, but on further reflection it seems inexpedient that I should trouble you with many details. The advantages of irrigation have been demonstrated in many countries; and it may suffice to say that the experience which is being gained in Victoria is no exception to the general rule. As showing the extent to which it is being practised where water sufficient can be obtained, I may mention that one gentleman near Echuca has pumping appliances for the irrigation of 2,000 acres, another at Gunbower for an area of 10,000 acres, and a farmer at Kerang, who said that he irrigated successfully for thirteen years, described a voluntary association of twenty-one farmers who by combining their labour managed to bring water for a distance of 13 miles, and to irrigate 3,000 acres of land. In every case the witnesses expressed themselves as highly satisfied with the results when water sufficient was obtainable; and many witnesses expressed the pleasure they would feel in paying a rate of 10s. per acre for water with which to irrigate their crops. While I was at Kerang, meetings of the "Irrigation Leagues of Victoria" were being held at the Shire Hall. The Rev. E. C. DeGaris, the President of the Central League, has been good enough to supply me with the following information respecting the Associations:—

About two years ago the agitation for water supply began to take the form of Irrigation Leagues. One was formed at Kerang, another at Durham Ox, another at Echuca, others at Rochester, Kyabram, Pyramid, Macoona, Mysia (Korong Shire). Eventually these local Leagues were united in an organization called the Central Irrigation League. This body has no particular place of meeting, and has held sessions in Sandhurst, Melbourne, Echuca, Rochester, and Kerang.

At the meeting at which you were present the other night nearly all the delegates travelled long distances: one came 300 miles, several 150, and the average distance travelled was about 70 to 90 miles each delegate, excluding of course the few who were local residents. The country embraced by the Leagues is very wide, including chiefly plains bounded by the Murray, the Dividing Range, and the Avoca River. In Wimmera the agitation is only now beginning, and the delegate from that territory, present the other night, was the first sent to our League meetings. Besides the country indicated, Bacchus Marsh and portions of Gippsland are also discussing various schemes.

There is no doubt about the earnestness of the people of the plains on the subject now, and every month furnishes new evidence of the growth of public opinion.

Much of our level country resembles that of the northern plains of Victoria, with the exception that it contains larger areas of very rich soil; but the land is owned in large blocks, and the circumstances of the population are not similar. There is room to doubt whether the rural population of Victoria for many years to come will be dense enough to utilize all the water known to be available for irrigation; but in New South Wales the population is more sparse, and those who cultivate the soil are not grouped together in communities as in Victoria. The industry of the country is almost wholly pastoral, though probably the time has come when pastoralists are prepared to irrigate largely for fodder crops as a sort of

* Since the remarks in the text were written Mr. Deakin has returned from America, and by the courtesy of the Honorable Charles Young I am able to lay before you descriptions and sketches of the buck scraper and ditching plough. The former implement may be used for excavating channels with slopes of not more than 4 to 1, and is especially suited for sand and loamy soils, in which situations it is superior to the scoop, removing such soil with a lead of 50 feet for 3d. per cubic yard.

of insurance against drought. The examples of irrigation, carried on with such remarkable profits in California, with which the Press has lately made the country familiar, relate almost wholly to fruit-growing near railways, giving quick access to a protected market of about 60,000,000 souls, and are such as we can scarcely hope to emulate here; but it is very gratifying to find that, as far as experience obtained in Australia itself has gone, it is almost uniformly satisfactory.

The amendment of the Victorian Water Conservation Act, made in 1883 (47 Vic. No. 778) enlarged the scope of the Water Trusts so as to include irrigation. The schemes of Messrs. Gordon and Black, while primarily designed for stock and domestic purposes, also embraced provision for irrigation to the extent to which the water was available and the physical formation of the country suitable. Now that the works of the Echuca and Waranga Shires Trust are nearly completed, there is reason to expect that irrigation will soon become part of the farming of the district. The pumps which will lift the water from the Goulburn are of a capacity to supply water enough (beyond what will be needed for stock and domestic use) for the irrigation of 6,000 acres, so that there is here a good opportunity of testing the profitableness of irrigation on a small scale before the Shires commit themselves to the great undertaking of constructing a weir across the Goulburn, which would supply water by gravitation. The site of the proposed weir is at Murchison. The drainage area of the Goulburn above that point is about 4,000 square miles, much of the country having an exceptionally heavy rainfall, and the river being also fed by the melting of the snow on the Great Dividing Range. The readings of the gauge placed on the Goulburn at Murchison for the last three years shows, according to Messrs. Gordon and Black, that the minimum supply available for winter irrigation is 134,000 cube feet per minute, and they estimate that the irrigable area commanded by the scheme is 610,000 acres, one-third of which could be under wet cultivation at any one time. The lowest discharge of the river in summer has been ascertained to be 28,000 cube feet per minute, which it is computed would be sufficient to irrigate 30,000 acres: and when to this is added the flood-water which it is proposed to store in the Waranga Basin (3,600,000,000 cube feet, after making allowance for loss from evaporation), the total area which may be irrigated in summer would be 62,000 acres. In their report upon irrigation, Messrs. Gordon and Black point out population "must be considered as the gradually obtained result of irrigation, and also the indispensable condition of its continuance." They are of opinion that at least eighty-five persons to the square mile, or one to 7½ acres, would be required to carry on a mixed system of farming on the northern plains of Victoria, where one-third the area would be irrigated and two-thirds under dry crops. On this basis the Goulburn scheme would require a population of about 80,000, or about ten times the present population of the locality, to utilize the water available. The following paragraphs embody their reasoning on this part of the subject:—

17. We find from a return appended to this Report, for which we are indebted to the Government Statist, that, in the agricultural districts comprised in our water supply schemes previously reported on, the population averages 8·3 per square mile. The area *occupied* is 523 acres per square mile, and 58·67 acres per head of population; and the area *cultivated*, 86 acres per square mile, or nearly 10 acres per head of population. According to the proportion ruling in North Italy, the area of fully irrigated land that could be cultivated per head of the population would be 3½ acres, but the difference between irrigated and dry crops would probably be less where agricultural machinery is more largely employed, and for the present we assume that 5 acres of fully irrigated land could be cultivated per head of the population. A simple calculation will show that, with the present population of these districts, supposing one-third of the present cultivated area to be irrigated for root crops, beans, lucerne, &c., only 75 per cent. of the land would be cultivated, *i.e.*:—

50 acres of dry cultivation, at 10 acres per head	5 persons.
25 acres of irrigated land, at 5 acres per head	5 „
75 acres cultivated by	10 „

That is to say, 25 per cent. of the land now cultivated would go out of cultivation.

Conversely, in order that only the present proportion of cultivation to occupied land—about one-sixth—may be irrigated to the extent of one-third, the population required will be 13·3, or an increase of 33·3 per cent.

33·3 acres of irrigation, at 5 acres per head	6·66
66·6 „ dry cultivation, at 10 acres per head	6·66
	13·3

18. In the same way it can be shown that, to completely irrigate the ordinary proportion—one-third—of these plains, and at the same time to dry crop the remainder, a population of at least 85 to the square mile would be required, or, if dry crops were entirely given up, and two-thirds of the land used for grazing, about half that number, *i.e.*, an increase of about 500 per cent. on the present population. From these figures it is evident that, even with an abundant supply of water, the extent of irrigation proper that could be carried on by the present population of the Northern Plains would be very limited.

19. For the second kind of irrigation, viz., occasional watering or flooding, after the first labour of preparing the land and forming the distributing channels, the labour required would not be so great, probably an additional 25 per cent. would suffice. Assuming this to be a fair estimate, and that it were desired and possible to obtain a sufficient supply of water to give an occasional watering to the whole of the area now cultivated (about one-eighth of the total area, by the official statistics), an addition of 25 per cent. to the present population would be required, or the amount of cultivation would have to be decreased by 20 per cent.

Water for the irrigation of a limited area will be obtainable from the northern lakes, fed by the Gunbower scheme, and elsewhere; but a great deal of information respecting river discharges, and the extent to which water can be stored in elevated positions at the heads of creeks, will have to be collected before the extent to which irrigation is practicable can be ascertained. The only river which has been gauged for a sufficient time to give useful data is the Goulburn. I append a list of localities where gauges have been or are being placed. (*Appendix* B.)

Witnesses examined at Echuca and in other localities volunteered opinions in favour of weirs across the Murray, so as to divert its waters into depressions on elevated land, whence it could be drawn off by gravitation for irrigation. The time may come when the Colonies interested in the waters of the Murray will be rich enough to weir (and it may be lock) as well as bridge that stream; but speculation on the subject at present is premature and of little importance. Some concern appears to have been expressed in the Legislature of Victoria lest New South Wales should divert snow-waters from their present flow into the Murrumbidgee; but this must have been in forgetfulness of the fact that one of the principal schemes sanctioned by the Government of Victoria depends in a large measure upon the waters of the Murray being drawn off by a cutting into Gunbower Creek, and that others are almost wholly dependent upon the impounding of the water of rivers which flow into the Murray.

The

The first of the schemes visited by the Commissioners is that known as the Gunbower. It embraces an area of 690 square miles, and has been undertaken by the Swan Hill Trust, who have obtained a loan from the Government of £31,600 and a Parliamentary grant of £9,111. Their works may be said to begin at a point on the Murray, 16 miles below Echuca, where the outflow of the flood-water into the Gunbower Creek has been facilitated by a channel 10 feet wide at the bottom, with slopes of 1½ to 1. The water from the Gunbower Creek is admitted by a similar cutting into Taylor's Creek, flowing thence into the Kow Swamp, which covers an area of 16,000 acres, and which it is proposed to fill to an average depth of from 12 to 14 feet. By a weir at the outlet the storage could be still further increased. From this lake the water is to flow along the Box Creek, from which it will be taken by the Macorna Channel into Tragoowell Swamp and the Loddon River. The total length of this line of conduits is 40 miles. Bagot's Creek, 3½ miles, and the Pyramid Creek branch of 30 miles brings up the total length to 73½ miles. The channels along Deep Creek, Gunbower Creek, and Barr Creek extend for a distance of 55 miles; from the weir across the Loddon at Kerang the channels to feed a series of lakes lying to the north-west extend for 12 miles; and from the Leaghur dam on the Loddon to Lake Leaghur, and northwards by Wandella Creek to Lake Meering, Little Lake, Lake Don, Wandella Lake, Pelican Lake, and Lake Elizabeth, the course is 28 miles. In all, this scheme provides for the conveyance of water for a distance of 168 miles, and the conversion of a large number of lakes and swamps into important reservoirs, from several of which water may be available for irrigation. The surface inclination north-westerly from Mitramo to Kerang, 37 miles, is 1 foot to the mile; and from Kerang to Swan Hill, 33 miles, it is 0·734 per mile. One of the principal works in this scheme is the weir across the Loddon, below the junction of Pyramid Creek, near Kerang, which has been completed at a cost of £5,211. It will have the effect of diverting a large body of flood-water along the Sheepwash Creek to Reedy Lake, Lake Charm, and other natural basins to the west of the river. I am indebted to Mr. H. C. Kempson, C.E., the Engineer to the Trust, for the following particulars showing its construction:—

	ft.	in.
Total length of weir, including wings	512	0
Length of east wing	136	0
„ west wing	176	0
„ crest, including notch	200	0
„ notch	32	0
Breadth of weir	12	0
„ cushions (aprons)	12	0
„ cushions, front of sluices	20	0
Height of weir at notch	9	6
Depth of piles in ground	12 to 18	0
„ sheet piles	8 to 15	0
Slopes of face	Vertical.	
„ aprons	Horizontal.	

Sluices (four in number) each 4 feet by 3 feet in clear construction.

Two rows main piles 12 feet apart, with distance pieces and braces internally; also tie-rods at 16 feet intervals; double wailings and sheet piles, both up and down stream; six cross-walls or shields of sheet-piling; wings; single rows of main piles with double wailings and sheet-piles, the interspace filled with gravel and clay, puddle-rammed.

Sluices– Top, bottom, and sides of 3-inch planks, dowelled, and lined with roofing felt, and 1-inch planking fixed diagonally; doors, two thicknesses of red-pine with roofing felt between, covered with 4-lb. lead outside, worked by 2-inch square-threaded lifting-screws and box-keys extending well above highest flood-level, from special platform

The next series of works visited by the Commissioners were those of the united Shires of Echuca and Waranga. The most concise description which I can give of these works will be in the language of Mr. Walter Scott Murray, C.E., Engineer to the Trust, whose evidence before the Royal Commission I had an opportunity of taking down in shorthand. He said:—

The principal works authorized and completed, or in process of construction, consist of the main channel, the length of which, from the pumping site on the Goulburn, a mile and a half above the township of Murchison, to the Cornella Creek, is about 85½ miles. The works at the pumping site are in course of construction, and consist of a pumping shaft, depth 46 feet, lined with brick, from which to the river there is a tunnel 6 feet by 4, lined with timber and puddled with clay. The entrance from the river is closed by a sluice-gate protected by timber wings. The top of the brick shaft is finished with concrete and levelled for the engine-beds. The discharge-pipe from the pumps delivers the water into a brick receiving bay, where it passes into the receiving channel by regulating brick weirs. The engines are of 270-horse power, and the pumps (Robertson's patent) will discharge 38 cubic feet of water per second, or 20,000,000 gallons in twenty-four hours. The machinery cost about £5,000, and the tunnel and shaft £1,500. Pumping operations will be commenced on the 1st June, 1885. From the discharging bay at the pumping site for a distance of 3 miles the fall of the channel is 6 inches to the mile, the bed width 8 feet 3 inches, and the depth of water 2 feet 9 inches. For the next 5½ miles the fall is 9 inches to the mile, and the bed width 6 feet 6 inches. At this point the north-eastern channel takes off, and follows approximately a course parallel with the Goulburn. The capacity of the main channel up to the point of offtake is 20,000,000 gallons a day; and from the offtake to the Cornella Creek it is 15,000,000; thence to Lake Cooper it is 12,000,000 gallons; thence to Cornelia Creek it is 10,000,000 gallons. The fall of the channel from the offtake of the north-eastern channel to the Waranga Basin Crossing is 9 inches per mile, bed width 4 feet 6 inches, and depth of water 2 feet 9 inches. From the Waranga Basin Channel there is a regular fall of 6 inches per mile, bed width 4 feet 9 inches, depth of water 3 feet. From the Cornella Creek to the Cornelia Creek the bed width is 4 feet 6 inches, and depth of water 3 feet. Throughout the whole of the main channel the side slopes are 1 to 1, except from the Cornella Creek to Lake Cooper, where the slopes are flattened to 1½ to 1. At the crossing of the Waranga Basin the channel is embanked. The other principal works are timber weirs across the Wanalta Creek, and two across Cornelia Creek. The north-eastern channel is 48 miles in length from the offtake at the main channel to the point where it joins the drainage channel. The branch No. 1 shown upon the plan is about 4 miles in length, and also joins the drainage depression; branch No. 2 is about 18 miles in length, and it also joins the drainage depression. The channel is partly excavated, partly embanked. There are regulating sluices every 3 or 4 miles, and bridges across public roads and private property. In a length of 70 miles of channel only 24 miles pass through private property—the rest are taken along the roads. The capacity of the channel at the offtake is 15,000,000 gallons, diminishing to 5,000,000 gallons in the parish of Koyuga. The capacity of the branches is four and five million gallons each. The fall of the channels averages 12 inches per mile; in some places it is not more than 8 inches, in others it is as steep as 2 feet. The Koyuga drainage channel is 33 miles long. The other channels either cross the lie of the country or follow the highest ridge, while the drainage channel carries the flood-waters into the natural depressions. We supply water when it is wanted, and drain the country when there is too much. Two other channels shown on the plan, one for drainage and the other for supply, the latter having a capacity of from five to two million gallons. Three tanks are in process of construction, and three or four months hence we propose to construct ten or twelve more to give supplies at particular points, so that people and stock can obtain water without damaging the channels. The capacity of the tanks is 200,000 gallons; they are capable of being filled from the channels, and they will be fenced round, to prevent injury and pollution by stock. Floods' patent lifts will be used to raise the water from the tanks to the iron troughs to be placed alongside. The designs for the Goulburn weir have been sent in to the Water Supply Department, but not yet dealt with. The

object

object of this weir is to supply the whole of the channels by gravitation instead of pumping. It would take several years to construct the weir. There are several small channels to make, and the Waranga basin has to be filled. Water will, in June next, be brought within 2 or 3 miles of every property in the district. The channels of the high level drains command the whole of the country, and they are designed to be enlarged at small cost, so as to serve for irrigation. The present pumping supply will be sufficient to irrigate 6,000 acres at one spot or in different localities as desired. The total area of the district is 880 square miles, and the area of the Waranga basin, which it is proposed to fill with flood-water, is 11½ square miles. The drinking approaches to the channels, where they run through private property, are made with slopes of 4 to 1, and occur at quarter of a mile intervals. It is estimated that the cost of the Goulburn weir, including compensation for land, will be about £60,000.

The operation of the Wimmera United Waterworks Trust affords another remarkable instance of the way in which a perfectly arid country has become well watered, by the judicious construction of weirs across its watercourses, which were practically dry creeks, for "in summer they retain water only at a few places." These weirs, owing to the level nature of the country, have impounded immense sheets of water which otherwise would have run to waste, and by the cutting of channels, the district, embracing an area of some 2,000 square miles, has been reticulated with water to its remotest parts. Water so diverted has also been stored in tanks and natural depressions, and a supply ample for all requirements short of irrigation has been obtained. The schemes of water conservation in this district were also outlined by Messrs. Gordon and Black, and they have been carried to a most successful issue by the Trust. The Trust has expended upwards of £95,000. The works represented by it are so numerous that I shall not attempt to particularize them, but, fortunately, by the courtesy of Mr. A. B. Clemes, the Secretary to the Trust, I am in a position to hand you a full description of the works, with a map showing the outlines of the scheme. You will, no doubt, observe that although the Wimmera was essentially a dry district, having no water in its creeks in summer, so great has been the storage that, in one case, water discharging at the rate of 90 cube feet per second is being carried to the Coorong Swamp—a distance of 80 miles from the point of diversion. A special feature in the scheme is, that a plateau of 200 square miles, 50 feet above the bed of the river storage, is being supplied with water by means of steam-engine and pumps, which raise the water at the rate of 600 gallons per minute, and it is conveyed thence through 6,500 feet of 9-in. cast-iron piping to the reservoir.

I append a return of the various Water Trusts formed under the Water Conservation Acts (*Appendix* C) which will no doubt be of interest.

Reviewing what has been done under the Water Conservation Acts of Victoria, I may be permitted, in conclusion, to suggest for your consideration the propriety of inviting the Government to follow a similiar policy here, with such modifications as your knowledge of the different circumstances of the Colony may lead you to deem expedient. This policy I may briefly recapitulate as follows :—

1. That a survey of the principal drainage areas be obtained with all practicable speed from engineers competent to advise the Government as to the best means of storing and distributing water within boundaries to be proclaimed by the Government.
2. That legislation be proposed, making provision for—
   (*a*) The incorporation of municipal districts, and conferring on bodies elected by the ratepayers, of power to enable them to devise and execute works for the conservation and distribution of water in the districts they represent.
   (*b*) Empowering Government to raise loans for the construction of works for water supply, and to lend the money to municipal bodies upon the security of their rates, mortgage being taken for the payment of interest and repayment of loan within a specified period; the plans and estimates of the works being in the first place subject to the approval of the Government, and the construction of the same being subject to periodical inspection by their officers.

I have, &c.,
CHARLES ROBINSON,
Secretary.

APPENDIX.

A.

WATERWORKS TRUSTS.

Loans raised, 1881, £400,000. Parliamentary Grants, £100,000.

Existing Waterworks Trusts, their Loans and Parliamentary Grants for Head Works.

Trust.	Loan authorized.	Amount paid.	Parliamentary Grant allotted.	Amount paid.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Loddon United	30,000 0 0	30,000 0 0	8,649 16 10	8,649 16 10
St. Arnaud	20,000 0 0	19,490 0 0	5,766 11 3	.....
Swan Hill	31,600 0 0	31,551 0 0	9,111 3 4	7,553 1 10
Stawell. (North-east Riding)	1,370 0 0	1,370 0 0	395 0 0	316 16 3
Wimmera United	94,398 0 0	92,433 0 0	27,217 12 7	10,341 4 7
Bet Bet	6,000 0 0	4,028 0 0	1,353 19 6	.....
Avoca United	15,630 0 0	15,630 0 0	4,506 11 5	1,913 18 11
Shepparton	16,000 0 0	15,470 0 0	3,690 12 0	.....
Echuca and Waranga	116,000 0 0	45,552 0 0	26,756 17 0	.....
Lowan	15,829 0 0	13,246 0 0	3,681 3 2	.....
Benalla (Town)	8,900 0 0	7,834 0 0	.....	.....
Echuca „	7,000 0 0	6,920 0 0	.....	.....
Maryborough (Town)	43,000 0 0	43,000 0 0	.....	.....
Kyneton „	26,000 0 0	24,560 0 0	.....	.....
Romsey „	4,000 0 0	3,934 0 0	.....	.....
Horsham „	14,300 0 0	13,055 0 0	.....	.....
	450,027 0 0		91,129 7 1	
		Unallotted ...	8,870 12 11	
			100,000 0 0	

B.

B.

List of Gauges established on Rivers.

Name of River.	Locality where situated.
Murray	Swan Hill.
„	Wentworth and Albury, New South Wales.
„	Echuca and Euston, New South Wales.
Goulburn	Seymour and Murchison.
Richardson and Avon	Banyena.
Wimmera	Horsham.
Campaspe	Barnedown, Rochester.
Loddon	Bridgewater and Kenykavial.
Mitta	Tallangatta.
Kiewa	Kiewa.
Broken	Benalla. Not yet fixed; in course of erection.
Ovens	Wangaratta. „ „
Avoca	East Charlton. Recently fixed.
Hopkins	Allansford. Not yet fixed; „
Little	Railway Station. „ „
Werribee	„ „ „
Tambo	Bruttеen. „ „

C.

General Description of Waterworks Districts, character of Works, &c.

Name of Trust.	Area of Waterworks in square miles.	Population	Sources of Water Supply.	Description of Work.
Loddon United	1,037	3,888	Loddon River and its anabranches	Weirs, distributing channels, tanks, and improvement of creeks.
S. Arnaud Shire	1,940	6,984	Partly from the Avon River, partly from local catchment area.	Storage weirs, tanks, dams, and wells.
Swan Hill Shire	10,000	6,479	Murray River with its anabranches and the Loddon River.	Off-take weirs, distributing channels, storage weirs, dams, and tanks.
Stawell N.E. Riding	128	512	Local catchment areas	Tanks and dams.
Wimmera United	2,100	1,134	Wimmera River and its anabranches and the Richardson River.	Weirs, channels, storage weirs and dams, and tanks.
Bet Bet Shire	360	4,725	Avoca River and local catchment areas.	Weirs, channels, tanks, and dams.
Avoca United	450	1,800	Avoca River and anabranch	Weirs, tanks, and dams, and Charlton water supply.
Shepparton Shire	715	6,574	Broken River and anabranch	Weir, distributing channels, tanks, dams, and wells.
Echuca and Waranga	860	6,235	Goulburn River	Pumping machinery, distributing channels, and tanks.
Lowan Shire	2,680	3,000	Local catchment areas	Tanks, reservoirs, and wells.
Benalla	Township	1,654	Broken River	Steam-pump, iron tank, and reticulation pipes.
Echuca	„	4,789	Murray River	Steam-pump, tower, tank, and reticulation pipes.
Maryborough	„	3,297	M'Callum's Creek	Reservoirs, and main and reticulation pipes.
Kyneton	„	3,062	Little Coliban	„ „ „
Romsey	„	400	Bolinda Creek	Weir, channel, main and reticulation pipes.
Horsham Borough	„	1,644	Wimmera River	Steam-pump, main and reticulation pipes (existing Horsham Waterworks).
Yarrawonga	388 nearly	.....	Broken River	Weirs, distributing channels, dams, tanks, and Yarrawonga town supply.

REPORT ON THE BARWON RIVER, AND THE TARRION AND CATO CREEKS.

To the Secretary of the Commission,—

Sir, Brewarrina, 19 May, 1885.

I have the honor to report that, in accordance with your instructions of the 9th ultimo, I have made inquiry regarding the evidence which can be obtained at Brewarrina on the subject of water conservation. I have every reason to anticipate that the witnesses who will give evidence here will furnish much information of a valuable character.

By actual levelling I have found that from still water above to still water below the rapids at Brewarrina there is a fall of 10 ft. 8 in. At the time when these levels were taken, viz., the 5th inst., the reduced levels above and below the rapids were 353·65 and 342·98 respectively. As the volume of the water in the river increases, the influence of the rapids extends to a greater distance, and in consequence the apparent fall diminishes, till in times of high floods the river surface assumes a uniform slope, and the only indication of the existence of the rocky bar is that furnished by the increased velocity in its vicinity.

Assuming that an effective fall of 9 feet is available, the power which can be derived from it is about 1-horse power for every cubic foot per second of discharge. There is unfortunately no place near Brewarrina which is suitable for gauging the discharge. On the upstream side of the rapids a very deep pool of almost still water extends for many miles. The depth of this pool just above the rapids is said to be no less than 30 feet. I went up the river to a distance of about 6 miles, and failed to find a bed at 10 feet depth throughout that distance. With the experience I have obtained regarding the discharge of the river near Walgett, and after again inspecting the flow at Brewarrina, I have come to the conclusion that, although there is no apparent flow at present into the river between Brewarrina and Walgett, the discharge of the river between these places is increased by percolation. The discharge at Brewarrina is certainly greater than at Walgett. This I attribute partly to the increase by percolation, and

and partly to the fact that the rocky bar at the former place acts as a dam, in stopping not only the water within the river channel but that flowing beneath it. The discharge at Walgett is only about 15 cubic feet per second, while that at Brewarrina, so far as I can judge, is not less than 25 to 30 cubic feet per second. Assuming that the latter discharge is correct, there is a loss of 30-horse power, and this, too, close to the township of Brewarrina, and in a place where water is greatly wanted. Supposing that so much as 30-horse power would be obtainable for the purpose of pumping water from the river, and allowing for a loss of 25 per cent. in the working of the necessary machinery, the quantity which could be raised to the average level of the land near Brewarrina would be about three and a half million gallons per day. This quantity of water would irrigate from 1,300 to 1,400 acres of land under the ordinary system; or, if used under the asbestine system for the irrigation of fruit trees, it would be sufficient for nearly 30,000 acres.

In connection with the question of putting weirs in the Barwon, I may point out that the rocky bar at Brewarrina gives great encouragement to such a project. The fact that a splendid sheet of deep water can exist permanently in the Barwon is a most important point to have established, as without such an instance to the contrary it would naturally be assumed that the immediate effects of a permanent dam of any kind in the river would be to cause the deposit of a large quantity of silt.

At a distance of about 4 miles from Brewarrina the Cato Creek flows in a course approximately parallel to that of the Barwon. The creek is in reality a branch of the Barwon, but instead of flowing into that river direct it joins the Bokhara. The length of the Cato Creek is estimated at 60 miles. At the head its cross section, as measured roughly by me, is 1,500 square feet, and opposite Brewarrina about 2,000 square feet; while towards the Bokhara its capacity increases considerably. Assuming the dimensions opposite Brewarrina as an average of the whole, the total capacity is 633,600,000 cubic feet. As it would probably not be practicable to utilize more than one-third of this, it may fairly be stated that in the Cato Creek there is available storage for 210 millions of cubic feet of water, or (say) 1,300 million gallons. Near the punt at Brewarrina, and on the banks of the Barwon, there is a large boulder which, it is said, must be under water before the flood-water will pass down the Cato. The reduced level of the top of the boulder is 354·59 feet, and it is about 11 feet 7 inches above the present water level on the downstream side of the rapids. At the inlet of the Cato Creek, the height of its bed above the present water level is nearly 15 feet, but the effect of a rise at any particular point cannot be estimated without more levels, and in both cases the figures regarding the floods required to fill the Cato should only be taken as approximate. It is, however, quite clear that a large supply could be stored in the Cato, and that flood-water which in ordinary seasons runs to waste could be utilized for this purpose. For the proper investigation of this question a longitudinal section of the Barwon from Brewarrina to the head of Cato Creek should be made, and special cross sections should be taken at the places where rocky bars are met with. Tarrion Creek, which is distant about 7 miles from Brewarrina, occupies a position on the south of the Barwon, corresponding to that of the Cato on the north. These creeks or ana-branches leave the river on opposite sides near the same place. From the nature of the country the Tarrion Creek appears to derive much more benefit from the surface water than the Cato does; but on the other hand, the flood in the Barwon requires to rise about 5 feet higher to cause a flow into the Tarrion than is required for flowing into the Cato. Near the place where the Brewarrina and Byrock Road crosses the Tarrion Creek is a splendid sheet of water, which, I was informed, extended for 6 miles without a break, and with a surface width of about 200 feet. At this place the Tarrion Creek is much larger than the Cato. If the dimensions of the Tarrion for 6 miles of its length can be taken as the same as at the Byrock Road crossing, the total storage capacity for that length would be at least 100,000,000 cubic feet, or (say) equal to an available capacity of 45,000,000 cubic feet. The portions of the Tarrion Creek which are adapted for water storage, though said to be much less in the aggregate than the length of the Cato, afford nevertheless a better and more permanent storage than any part of the Cato of which I have heard. On the whole I should recommend that, as a first step towards utilizing flood-water from the Barwon in the neighbourhood of Brewarrina, cross sections of the Cato and Tarrion Creeks should be taken at such intervals as would give a good approximation to their capacity, and that a longitudinal section of the Barwon should be made from Brewarrina to above the inlets of these creeks. I may mention that in the case of the Tarrion Creek there is a perceptible fall in the surface of the ground from the bank of the creek in a southerly and westerly direction, so that the conditions are favourable for the distribution of any water which could be spared for irrigation.

I have, &c.,

H. G. M'KINNEY, M.E., M.I.C.E.,
Engineer to the Commission.

REPORT ON THE MACQUARIE RIVER AND THE DISTRICT BETWEEN THE MACQUARIE AND THE BOGAN RIVERS.

To the Secretary of the Commission,— Sydney, 29 May, 1885.

The Macquarie being a fair type of that numerous class of Australian rivers which, beyond certain points in their course, gradually diminish in volume, definite information regarding the cause of this diminution is interesting and important. The importance of the question was shown by my investigation of February, in the course of which I ascertained that of 114·5 cubic feet per second which then flowed past Dubbo only 52 cubic feet per second went beyond Warren. In my inspection of the Macquarie during the past month I found that only about 20 cubic feet per second were flowing past Dubbo, and that the flow entirely ceased at about 18 miles up stream from Warren. In my report on the former experiment I showed that not more than about 9 per cent. of the discharge at Dubbo, or 16½ per cent. of the total loss, could be due to evaporation, so that at least 83⅓ per cent. of it was due to percolation and absorption. As the discharge of the river decreases, the velocity decreases in a corresponding degree, while but little change takes place in regard to the surface exposed to evaporation. The proportionate loss by evaporation therefore increases with a diminishing discharge. Taking the rate of evaporation as one-eighth of an inch in 24 hours, I estimate that while the discharge at Dubbo was 20 cubic feet per second, 7½ cubic feet per second was lost by evaporation between Dubbo and the place at which the flow ceased. The loss by evaporation was therefore about 38 per cent. of the discharge, leaving 62 per cent. to be accounted for by percolation and absorption. In the first series of experiments the loss of water between

between Dubbo and Warren, exclusive of loss by evaporation, was about 52 cubic feet per second. This is considerably less than half a cubic foot per second for every mile of the river, or about two-thirds of an inch per day over the wetted surface of the river-bed. The rate of percolation worked out in the same manner in the second case for the smaller discharges amounts to only a quarter of an inch per day over the wetted surface. These figures must only be regarded as approximate, as it would not be possible to ascertain the exact wetted area; but the result agrees with the opinion I had formed after inspection of the banks and bed of the river, that the loss arises more from lateral than from downward percolation. Such a loss as this would not be unexpected in the case of a canal following the ridge line of an alluvial tract of country; but in regard to rivers flowing in stable channels—that is, in channels following the natural drainage lines—it is natural that there should be a gain from and not a loss by percolation. In my report on the Darling, dated 19th instant, I have pointed out that on the portion of that river between Walgettand Brewarrina there is a gain by percolation, and that in the present low state of the river this gain is of considerable importance. I have ascertained beyond doubt that there is a further gain in the same manner between Brewarrina and Bourke. Percolation into the river at Bourke is at present evident, as the water in the river is about 4 feet below the level of the top of a saturated stratum. That the percolation in the case of the Macquarie is from the river arises chiefly, if not entirely, from the fact that the course of the river north of Narramine is not now a true main drainage line. While the country slopes northward with the river, it also slopes in a westerly direction towards the Bogan; and I believe it will be found that the line of greatest slope is towards the Bogan in the direction of Cannonbar, and not toward Mount Harris and the Macquarie Marshes. While the river has been depositing silt in its bed in the form of a wedge, the thick end of which is near Dubbo, another wedge having its thick end on the west bank of the river has been formed by the deposits of silt left by successive floods. This characteristic of the Macquarie affords remarkably favourable conditions for the diversion and storage of flood-water. In the district lying between the Macquarie and the Bogan there is a complete network of creeks, all or nearly all of which are well suited for the conveyance and storage of flood supplies. The first place of this description to the north of Dubbo is about 3 miles from Narramine, in a south-easterly direction. At this place is an immense lagoon about half a mile in width, and probably 30 feet deep in the centre, but which becomes shallow towards the river, from which it derives a supply in very high floods. This lagoon is at the head of the Boggy Cowal, the flood-water in which passes on to the Beleringa and Gunningbar Creeks. I had not an opportunity of following the course of the Boggy Cowal, but ascertained that there are already three dams across it.

At Buggaboo Point, about 10 miles down stream from Narramine, the river takes an abrupt turn in an easterly direction, and although the left bank at the bend is nearly 40 feet high, there is an overflow there in high flood. The flood-water passes from this place in a broad shallow depression to Buddah Lake, which is said to hold a good permanent supply. The left bank at Buggaboo Point consists of an alluvial deposit throughout, and, so far as I could ascertain, there is no favourable site for a weir in the Macquarie near that place.

At about 16 miles by road from Narramine there is a rocky rapid in the Macquarie, which bears some resemblance to the rapid in the Barwon at Brewarrina. The bed of the Macquarie at Rocky Point, as the neighbourhood of the rapid is termed, consists partly of hard conglomerate and partly of soft sandstone, intersected by bands of ironstone. This rock has a mean length of about 250 feet in the direction of the river, and the surface is rough and waterworn, but nearly level from bank to bank. The width of the bed is about 200 feet, and the height of the left bank is about 40 feet. At the time of my inspection the water in the river had a clear fall of about 2½ feet, while there was a further fall of about 1½ feet in the 60 feet on the upstream side of the vertical drop, making a total fall of about 4 feet from still water above to still water below the rapid. Notwithstanding the presence of rocks across the river-bed, Rocky Point does not on the whole afford a satisfactory site for a weir. The river here is unusually wide. The banks consist chiefly of alluvial soil, and the rock is not of uniform soundness; still the site is probably the best obtainable on that part of the river.

There are two other possible sites for weirs—one about 200 yards down stream from the Rocky Point cataract, and the other about 250 yards further down. At the former place the bed of the river is only about 100 feet wide, about 30 feet of which consists of rock, the rock also appearing in the right bank to a height of 5 feet above the bed. At the second site, below the cataract, the width of the river bed is about 120 feet, and the height of the banks from 50 to 60 feet, rock appearing in the bed at both sides of the river, and the left bank is of sound material throughout its entire height. From a distance of 200 feet above to nearly half a mile below the site of the river is almost straight. This is a point of considerable importance, and one which adds materially to the value of this site.

At a distance of about 7 miles south of Warren there are two outlets from the Macquarie. At the river bank these outlets are well defined, and bridges have been built over them at a distance of about 120 feet from the bank. The more southerly and smaller of these outlet channels is provided for by a bridge having one span of 30 feet, while the larger outlet, which is about 600 feet further down stream, has two spans of 27 feet each. The beds of these channels are, in each case, about 23 feet above the river-bed, which here consists chiefly of a yellowish clay. After leaving the river the flood-water spreads over several square miles of low lands. The head of the Bird's Nest Creek at the edge of the lowlands is in a direction almost at right angles to the direction of the river, and at a distance of about a mile and a half. This creek crosses the Nevertire and Warren Road at a distance of about 4½ miles from Warren, and flows into the Beleringra Creek. At the downstream end of the great lagoon mentioned, that is, at a distance of 5 miles from Warren and 2 from the point where the flood-water leaves the river, another creek, stated by some to be the Guningbar Creek, takes its rise, and flows past Warren, at a distance of less than half a mile from the river. By levelling from the river at Warren to this creek I found that the bed of the creek is only about 5½ feet higher than the bed of the river.

It is necessary to explain that much confusion exists regarding the names of the creeks which run from the Macquarie towards the Bogan, the same creek being known by different names at different parts of its course.

From my inspection of the Macquarie I was in a position to arrive at the following conclusions:—

(*a*) That the damming of the river at or near Warren could be done at a moderate cost, and that the result would be to throw a supply down the Guningbar and other creeks.

(*b*) That the damming of the Macquarie at or near Rocky Point would be quite practicable, and that with a dam of 20 or 25 feet in height, a supply of water could be drawn from the river in ordinary floods; but that the cost of damming this part of the river would be heavy.

(*c*) That in the Boggy Cowal, about 3 miles from Narramine, there is storage capacity for a large supply of flood-water.

Considering that the conditions for diverting and storing flood-water in the district between the Macquarie and the Bogan are exceptionally favourable, I think that, as a first step towards carrying out works with this object, the following levels should be taken:—

(*a*) A longitudinal section of the Macquarie, from Dubbo to Mount Harris, with cross sections at every 5 miles, and additional cross sections at places where the flood-water leaves the river.

(*b*) A connecting line of levels between the railway bench marks and the river at Narramine.

(*c*) A section from the river to the great lagoon at the head of the Boggy Cowal, near Narramine.

(*d*) A connecting line of levels from the river at Warren to the railway bench mark at Nevertire.

(*e*) A connecting line of levels from the river at Mount Harris to the railway bench marks at Nyngan.

The lines of level here mentioned are indispensable for carrying out of works for the conservation and supply of flood-water from the Macquarie. That such works are practicable is beyond doubt, and the levels are required in the first instance to show the position, extent, and approximate cost of the works which would be most useful.

H. G. M'KINNEY, M.E., M.I.C.E.,
Engineer to the Commission.

REPORT ON THE UPPER MURRAY VALLEY.

To the President and Members of the Commission,—

Gentlemen, Sydney, 18 June, 1885.

Object of examination. The object of my examination of the Upper Murray basin was twofold: (first) to determine if it was possible to divert a portion of the river into the valley of the Billabong Creek, and thus establish a permanent stream between the Murray and Murrumbidgee Rivers; (second) to discover if it was possible to impound any large quantity of water on the large flats near the sources of the river to account for the supply of such stream.

Geological features. In order to give some impression of the principal characteristics of the valley from Albury upwards, I shall commence my report by a brief description of its geological and physical features. The geological formation of the valley on the right bank of the river for about 50 miles above Albury is granite. This is followed by sandstone schists and clay-slates tilted at a high angle, and metamorphosed by the intrusion of trap and gneiss dykes, which strata extend about 25 miles to Ournie. From this point to Bringanbrong Station, just below the junction of the Indi and Hume branches, granite again predominates, intersected in places by belts of schistose and trap rocks. Above Bringanbrong the metamorphic strata again prevail, and as a consequence the mountain ridges assume a wilder and more precipitous aspect. About 12 miles higher up both branches of the river enter defiles through the above strata, which are almost inaccessible. The Hume heads in the granite spurs of Mount Kosciusko, whilst the Indi heads in limestone springs, from marble or mountain limestone, in which fine specimens of fossil fish have been found.

Physical features. The physical features of the valley alter perceptibly with its geological features. Where granite predominates the mountain ranges and cross ridges have a gradual slope, and often near their summit recede into table-lands, whilst the valley itself opens out into large rich flats, and the river flows over low falls, followed by long stretches of deep and almost level reaches. Where metamorphic schists and eruptive rocks prevail, the valleys of the river and its tributaries close in to narrow gorges and rocky defiles, which rise with rugged precipitous flanks into high ridges or lofty peaks, distinguishable by their sharp outline. Shortly after leaving Bowna the road up the valley crosses low spurs and ridges which enclose the valley on either side of the river. On the Victorian side the ridges rise higher, and are more rocky and precipitous. The principal timber is composed of gum, box, apple-tree, peppermint, and wattle, and patches of fir in some of the gullies. After passing Wagra, about 30 miles above Albury, the aspect of the country all round is wild and mountainous. Everywhere appear high ridges, surmounted by peaks of varied form, which, as they descend into valley, throw out numerous long spurs. The junction of every creek or tributary is marked by flats, which increase in area higher up the river at the junctions of three main feeders, the Tooma, Hume, and Indi Rivers. On the New South Wales bank of the river the Gingellic, Ournie, Greg Greg, Wellaregang, Bringanbrong, Khancoban, Indi, and Tom Grogan Flats are the most notable.

Declivity of the river. The height of the Murray at Albury is 490 feet above sea-level. Its fall for 30 miles below Albury averages 1·18 feet per mile. From Albury to Jingellic, about 100 miles up by river, it increases to 2 feet per mile; thence to Tinialdra, about 35 miles higher up, it increases to nearly 3 feet per mile, which declivity it retains to the junction of the Indi and Hume streams. It flows with a most tortuous course through the flats, especially between Tintaldra and the above junction. From this point, following the Hume, the declivity increases but slightly for 10 or 12 miles, averaging about 5 feet per mile to the top of Khancoban flats, when it enters an almost inaccessible gorge for 15 or 16 miles, then crosses the Geehi flats, after which the declivity rises rapidly by frequent rocky falls to its sources in the spurs of Kosciusko. At Geehi flats the barometer read just 1,400 feet above sea-level, giving a total fall of 910 feet between that point and Albury. Following the Indi from its junction with the Murray the declivity averages about 5 feet per mile for 15 miles, and then rises rapidly in an inaccessible rocky defile for from 20 to 30 miles, when Tom Grogan's flat is reached. Here the bed of the river changes again to falls of from 3 to 5 feet, followed by long, almost flat reaches, for a distance of about 5 miles, when it is again enclosed by the huge rocky ridges of the main range, and the declivity increases rapidly by rocky falls to its source in a gully of the Pilot Mountain, which is 5,000 feet above sea-level. At Tom Grogan's flat the barometer read 1,730 feet above sea-level, or 1,240 feet above Albury.

From

From a rough section of the river at Tindaldra I estimate its discharge there at over 1,000 cubic feet per second. A few miles above the junction of the Tooma, and about 4 miles below Mr. Findlay's house, the discharge was about 675 cubic feet per second. The volume of the Hume River, just above Khancoban Creek, by rough measurement was about 400 cubic feet per second, and at Geehi flats about 285 cubic feet per second. The discharge of the Indi at Tom Grogan's was about 300 cubic feet per second. Discharge of the river.

From Albury to the junction of the Hume and Indi, for 15 miles above that point, the Murray stream runs over a succession of low falls, followed by long deep reaches, apparently almost level, the current being so sluggish as to be hardly perceptible. Above the Khancoban and Indi Falls the divided streams run as torrents, the rocky falls being sometimes over 10 feet high, as far as Geehi and Tom Grogan Flats, when they again resume their former condition of low falls and long reaches. Above these flats they again run as torrents. The bars or falls in the river below the junction of the Indi and Hume are chiefly formed of gravel of medium size, mixed with sand; above the junction the gravel is mixed with large boulders, whilst above Geehi and Tom Grogan the river has chiefly a rocky bottom. The average width of the bed from Wagra to Tintaldra is about 160 feet, and it has an average depth at summer level of about 4 feet for such width. Its banks have an average height of 10 feet on the flats above summer level, which increases to 30 or 40 feet when the valley closes in. They generally have a deep stratum of fine river silt on top, followed by 3 feet of gravel and sand mixed. The water is clear and soft to the junction of the Tumberumba Creek, when the tailings from the gold-fields discolour it. General description of river.

The stream is generally at its lowest level in June, July, and August, when the hard frosts contract the streams in the higher regions, and the mountains and high table-lands are covered with snow. The thaw sets in about the end of August, and during the next three months, in fact up generally to the end of December, the river is in flood from the melting of the snow. After that it gradually lowers until March, when the heavy autumn rains again increase its volume for the next month or two until winter sets in.

In investigating the feasibility of diverting the Upper Murray into the Billabung Valley, three objects were especially necessary of attainment: (first) to discover a pass in the dividing range through which the river might be diverted at the lowest possible point in its valley; (second) to discover the point at which a sufficient volume of water could be diverted to cross such pass; (third) to find out if the character of the intermediate country would permit of the construction of a canal at a reasonable cost. Guided by the advice of some of the oldest residents in the district I examined the head of the Jingellic valley, where I found a low pass by which the main road between Jingellic and Germanton crossed the Divide, about 17 miles distant from each place. By barometric measurement the height of this pass was 1,670 feet. Following the ridges east for about 1½ mile I crossed another pass nearly as low as the first, and possessing the superior advantage of very steep slopes on either side, so that a tunnel about 3,000 feet long would reduce the height by nearly 160 feet. Having determined on the lowest point in the Divide, I proceeded to examine the Tooma River, which is the largest branch of the Upper Murray, to discover if it was possible to divert its stream over the pass. This stream joins the Murray River about 20 miles below the junction of the Indi and Hume branches, and is far larger in volume than either of them. It rises on the northern slopes of Mount Kosciusko, and receives all the drainage of the extensive table-lands and mountain ranges between its source and Mount Manjar, flowing fully 45 miles in a north-westerly direction to that point. On its approach to Mount Manjar it changes its course abruptly to westerly, and rushes through a narrow rocky defile with precipitous sides, and over a series of high falls, till it reaches the base of the mountain, having fallen over 2,000 feet in about 8 miles. Near this point it is joined by Pound Creek from the north, which traverses a fine flat, over 3 miles long, above the junction. The valley now begins to open out into flats bounded by high ridges on either bank, till it is joined 20 miles lower down by the main Tumberumba River, formed by the junction of the Miracle, Paddy's, Tumberumba, and Manus Creeks, when it expands into rich extensive flats on both banks of the river, which continue until it reaches the Murray, about 12 miles below. By a rough measurement of the river at the junction of Pound Creek I estimated its discharge there at 450 cubic feet per second,—the height of that point read by barometric measurement, 1,650 feet above sea-level. The discharge and height were therefore sufficient for the purpose of a canal through Gingellic Pass into the Bullandry. It was impossible without a detailed survey to fix on the actual position of the off-take for a canal, but as the river rises very fast I presume that the required elevation would be obtained 1 or 2 miles higher up than the above point. This is supposing that the canal would be 90 miles long and would have a fall of 2 feet per mile. The distance between the point of off-take and the Gingellic Pass would be about 34 miles in a direct line; but by a brief examination of the intermediate country and a rough measurement on the map I estimate the probable distance of a contour canal at 90 miles. Out of the 450 cubic feet now available at the lowest season of the year, I would suggest that 200 cubic feet per second should be diverted by a contour canal, and conducted into the Billabong Valley by the Gingellic Pass. Canal from the Tooma River to the Billabong Valley.

The sectional area of such a canal would be 75 square feet, its depth 5 feet, its fall 2 feet per mile, and its duty or discharge 200 cubic feet per second, or 108,000,000 gallons per diem. My reasons for not recommending a larger canal are (first) because of the difficult character of the intermediate country it would have to traverse; (second) because a large supply would not be immediately required and might lead to waste; (third) on account of economy of construction. Size and fall of canal.

The character of the country the proposed canal would traverse is, as may be surmised in such a mountainous region, very rough and rugged, whilst the long bounding ridges of the different divides with their numerous spurs would probably increase its length nearly threefold. The dividing ridges generally rise almost precipitously from the beds of creeks to a height of 200 or 300 feet, and then slope away more gradually. Near their base they are but scantily covered with soil; in fact at intervals they expose a wall of solid rock, but as the slope decreases the depth of the soil increases. Where granite is crossed the soil is loose and somewhat porous, but the soft granite rock below affords excellent holding-ground when slightly puddled; where the slates are crossed the soil is chiefly a good stiff impermeable clay. At first sight, and especially to an inexperienced eye, the feasibility of taking a canal across such a rough country would seem very doubtful; but having seen much greater difficulties surmounted in California than this line suggests, and having laid out and constructed different large mining ditches in Kiandra on the same mountain ranges, such a scheme appears to me practicable and at a reasonable cost. Starting from the right bank of the Tooma River, the line of canal would cross the drainage lines of Marracle, Paddy's, Tumberumba, and Mannus Creeks, and also of the Ournie and Jingellic Creeks, and would then Character of country on line of canal.

pass

pass by tunnel into the Billabung Valley, whence it might pass on through Germanton and terminate in Urana Lake, affording provision for the irrigation of the intervening rich flats. Most of the above creeks could be crossed by wrought-iron fluming on high trestles, whilst a portion of the larger streams might at intervals be diverted into the canal to account for soakage and evaporation. The cost of such a canal to Jingellic Pass, supposing the distance to be 90 miles, and including tunnel and headworks, might be roughly estimated at £200,000, and as it would traverse Government land nearly the whole distance there would be no costly rights to resume.

Duty of canal.

I estimate that a stream of 200 cubic feet per second should be capable of irrigating 80,000 acres, or that each cubic foot should supply 400 acres. On reference to other countries it appears that a flow of 1 cubic foot per second irrigates—

717	acres in	India,	supplying several waterings;
630	„ „	Spain,	„ „ „
786	„ „	California,	„ „ „
1,168	„ „	Tasmania, for hay only.	

So that my estimate cannot be considered excessive, whilst if subsoil irrigation was generally introduced, it might be safely assumed that 1 cubic foot per second would irrigate over 1,000 acres, as no surface water is exposed to evaporation.

Return of canal.

Estimating the whole cost of canal at £500,000, and that it would irrigate 80,000 acres, then at a charge of only 10s. per acre per annum it would return 6 per cent. on capital, after providing 2 per cent. for repairs and supervision.

Motive power.

In consideration that the value of every 100 feet of fall of the above stream would represent over 2,000-horse power, in a commercial aspect such a scheme must be highly profitable. It is safe to assume that, owing to the elevation of the proposed canal, it would encourage the establishment of more than one large manufacturing centre, whilst such application would in nowise prevent the water supply afterwards being equally available for irrigation.

Reservoir sites

The small declivity of the river between Albury and the junction of the Hume and Indi branches prohibits the impounding of its main stream for diversion into the Billabung Valley, but the large flats at the entrance of and extending some 10 or 12 miles up both these valleys suggest the possibility of completely controlling the river under all conditions, by impounding its whole volume and the equalizing the flow of the stream at all times, or distributing it as the different seasons may require.

Murray reservoir site.

The area of the Murray watershed above the junction is about 1,100 square miles, over which there is an average rainfall of fully 48 inches annually. Supposing one-third of the rainfall to enter the river-bed, then its whole stream would be equal to a discharge of 40,888,320,000 cubic feet, or 254,734,233,600 gallons annually. This supply impounded would permit of increasing the volume of the Murray after the junction of the Tooma River to a constant flow of about 2,000 cubic feet per second. For the purpose of such a reservoir a fine position for a dam offers in the immediate neighbourhood of Mr. Findlay's house, about 1½ mile below the junction of the above affluents. Here two long rocky spurs, somewhat above 100 feet high, approach within about 3,000 feet. An embankment across the river 95 feet high connecting them would enclose about 17,000 acres, including nearly the whole of the Bringanbrong, Khancoban, and Indi flats. At an average depth of 60 feet this area would impound 44,431,200,000 cubic feet. Large tunnels with regulating valves through the spurs on either bank of the river would provide outlets from the lake, whilst a long bend in the spur on the Victorian side would offer facilities for a by-wash. Only three Italian lakes, viz., Lago Maggiore, Como, and Di Gardi would exceed such a reservoir in area. There is abundance of excellent material for the construction of the embankment in the neighbourhood. As a large portion of the reservoir would be in Victorian territory, it would either have to be purchased from that Government, or its construction might be undertaken by the joint Colonies, which, in consideration of an equitable adjustment of water rights, would be most advisable.

Khancoban reservoir site.

In case of the Murray reservoir being considered impracticable, there are two or three other sites worthy of notice. At the entrance of the Hume Valley a dam 80 feet high would throw the river back fully 12 miles, and would flood about 7,000 acres, including the Bringanbrong and Khancoban flats. The length of the dam would be about 6,000 feet; its extremities would abut on steep spurs of metamorphic schists. This basin, with an average depth of 30 feet, would impound 57,422,500,000 gallons of water.

Geehi reservoir site.

A dam 80 feet high across the narrow rocky defile of the river at its outlet from the Geehi flats would cover at least 800 acres with water, and would impound about 8,712,000,000 gallons. The flats are enclosed by the steep walls of long lofty ridges thrown out by Mount Kosciusko. The dam would be overshot, and constructed of rock; its length at bottom would be about 150 feet, and at top 500 feet. Its extremities would abut on the hard metamorphic rocks forming the walls of the defile.

Tom Grogan's reservoir site.

The outlet from Tom Grogan's Flats offers another somewhat similar position for an overshot dam. Such a construction 80 feet high would flood 2,000 acres to an average depth of 25 feet, and would impound 13,612,500,000 gallons. The dam would abut on walls of hard metamorphic schists on either side; it would measure about 100 feet at bottom and 500 feet at top.

Recommendations.

As the result of my examination of the Upper Murray valley I beg to make the following recommendation:—(First) that a longitudinal section of the river be extended from Albury to the junction of the Hume and Indi; (second) that a line of levels be run across from the mouth of the Gingellic valley to the pass at its head, and from Wallaregang up the Tooma River to the point of offtake of the proposed canal; (third) that the line of such conduit between those points be levelled and traversed; (fourth) that the head of the Billabung Valley be examined for a site for an impounding reservoir to receive the canal supply; (fifth) that failing the discovery of any such receiving basin, Urana Lake should be examined for the same purpose; (sixth) that the continuation of the canal down the Billabung be surveyed; (seventh) that a gauge be fixed in the river at Tintaldra, and advantage be taken of Mr. Bowden's kind offer to record its readings; (eighth) that all unalienated lands on the Bringanbrong, Indi, Khancoban, Geehi, and Tom Grogan flats should at once be reserved from sale; (ninth) that the sites of the above suggested reservoirs should be surveyed; (tenth) that a Conference between certain members of this Commission and certain members of the Victorian Royal Commission on Water Supply and Conservation be invited, for the purpose of suggesting certain definite lines of legislation to the Parliaments of each Colony as to the treatment of rivers and watercourses which border or intersect the boundaries of the two Colonies.

FRED. B. GIPPS, C.E

1885.

NEW SOUTH WALES.

ROYAL COMMISSION—CONSERVATION OF WATER.

MINUTES OF EVIDENCE

TAKEN BEFORE THE

COMMISSIONERS.

ERRATA.

Page 8, Question 175, line 3. The words from "In the country" to "down the coast," at the end of the paragraph, should appear as the beginning of Question 176, by Mr. Russell Barton, M.P.

Page 14, Question 227, line 48. *After* "Narrandera" *insert* "Appendix B."

Page 17, Question 262. For "Appendix B" read "Appendix C."

Page 36, Question 820. For "Appendix D 1" read "Appendix E 1."

SYNOPSIS OF THE EVIDENCE.

H. C. Russell (Second Examination).

Wells.

PAGE.

Number on Map.	Name of locality.	Depth in feet.	Supply in gallons.	Temperature, Fahrenheit.	Rise of water in well to within feet of surface	Remarks.
1	Wee Wattah Station.....	142	℔ min. 50	82°	...	Good water; five other wells on same station, depth from 134 feet to 142 feet, near mud-spring.
3	Gnalta Station	272	...	...	100	Artesian.
5	Mullyer	49	12	63	...	Four bores close to mud-spring.
	Medlow	12	℔ hour 36	...	...	Near Farina (S.A.), at 17 feet sand-drift.
	Goonery Station	122	1,000	...	...	
	Near Goonery	61	...	...	21	Abundant water.
	,, ...	69	...	...	3	Fossil bones, large teeth, at 34 feet.
	,, ...	76	65	...	...	Sunk 6 feet deeper gave 1,000 galls. per hour.
	,, ...	443	..	...	...	Tree found at 300 feet from surface.
	Bingera.....	75	..	...	...	Water rose 6 feet in 1½ hour.
	Tolarno.....	93	...	...	...	Salt water (south of Wilcannia).
	,, ...	135	...	...	...	Salt water, very fine sand-drift, deeper water fresh.
13	Dunlop Station	488	...	...	90	Strong supply of fresh water.
	,, ...	573	...	...	15	Abundant. In bore met with petrified wood, trees, and fossils. At 550 feet, 5 feet sandstone.
	Mount Browne	...	...	...	...	Inexhaustible; supplies engine and 18,000 sheep
16	Girilambone.....	155	...	...	...	Abundant fresh water, rose 22 feet 6 inches.
17	Near Forbes..	136	...	..	...	Rose 76 feet in a few minutes; white sand.
	St. Ann's	60	...	...	...	At Cooper's Creek, north of Wilcannia.
	,, ...	90	..	...	..	
	Urisino Block	430	..	...	100	Bore went through limestone rock with fossils.
	Avon Plains....	28	200	...	...	In Victoria.
	Tarkanina	1,220	..	...	...	Rose 20 feet above surface, north of Farina (S.A.); salt water at 800 feet.
23	Walgett	...	...	...	...	Salt water in fine drift sand.
,,	Sale	62	...	...	10	In Gippsland (V.)
,,	,, ...	231		...	...	Artesian, overflowing, bringing up dead leaves, &c.
26	Zaen	400	...	...	.	Wimmera District; plum-stones at 250 feet.
27	Gnalta	127	..	...	...	Rose 50 feet in the well.
	Parkes	40 to 50	...	...	...	Unlimited supply; similar wells in the neighbourhood.
	Ardennes	300	...	..	..	Wilcannia District; first class quality.
	Gilgoin	28	.	...	...	Sandy bottom; rose to surface; skeletons of large animals and fossil teeth met with.
	Collana	...	...	..	..	Artesian well, 450 miles from Adelaide.
32	Depôt Glen	55		...	..	In Albert District; unlimited supply.
	Boorara	40	...	...	...	In fine sand; brought up charcoal.
34	North of Walgett	80	...	..	...	In fine sand.
	St. Stephenson	205	.	...	...	Spring of fresh water 274 miles north of Adelaide.
	Brindigabba.....	125	...	..	43	Near Hungerford, close by at 130 feet no water; shells and lignites at 120 feet.
38	Winchelsea	488	300 to 400	...	...	In Victoria; artesian.
39	Mallee Scrub	112	..	...	...	In South Australia; the Mulga gives a supply of 2,000 gallons per hour from below loose drift.
42	Near Bourke	192	..	.	...	
,,	,, ...	61	...	...	...	Rose 40 feet in borehole.
	Sunk by contractor on Nyngan-Bourke railway line	76	...	...	...	Salt water; bore passed through quartz and hard clay.
		76	...	...	...	Salt water; bore passed through clay and sand.
		115	...	..	...	Salt water; continued to 135 feet without fresh water.
		70	...	...	...	Salt water; at 142 feet more salt water rising 50 feet.
		150	...	...	...	No water of any kind.
	Snowtown	166	200	...	...	In South Australia; rose to 16 feet above surface; good water.
	Cobar	627	℔ day 300	...	...	
52	Greenhills	90	...	...	...	On Barcoo, in several wells; water as soft as rain-water.
	On Darling River Downs	80	..	.	.	
	Narramine	...	...	...	...	Petrified myall at 180 feet.
54	Nondaro	140	...	..	..	Good water.
	Wandoola.....	159	..	.	..	Liverpool Plains; through 100 feet red soil, with layers of gravel with fossil bones and teeth.
	,, ...	60	..	...	...	Overflows for last fifteen years.
	Near Silverton	240	.	...	..	Rose 72 feet in the well.

P. B. Moore.

James Tyson, junior.

J. E. Pearce.

ROYAL COMMISSION ON CONSERVATION OF WATER, &c.

MINUTES OF EVIDENCE.

TUESDAY, 1 *JULY*, 1884.

Present:—

Mr. BARTON, M.P.,	Mr. GIPPS, C.E.,
Mr. DONKIN, J.P.,	Mr MURRAY, M.P.,
Mr. FRANKLIN, C.E.,	Mr. TOWNSEND.

R. L. MURRAY, Esq., M.P., IN THE CHAIR.

Mr. David Greig called in and examined:—

Mr. D. Greig. 1 July, 1884.

1. *Chairman.*] You are the principal in the firm of Messrs. John Fowler & Co., Leeds? Yes.
2. You are manufacturers of excavating implements suited to the purpose of water conservation? We have been making such machines, some for the Australian Colonies—for South Australia, and there has been one standing here for some time, owing to the machine not being able to comply with the Government specification, which is to be modified now. I think we have sent ten machines to South Australia. Sir Thomas Elder has four of them for himself. The Queensland Government also have two of our excavators.
3. Have you had any experience in the working of these machines in the Colonies? Very little; my chief knowledge of it is from what I gather from men who have been working them. I have worked them at home simply for the purpose of perfecting the invention. I have had an opportunity of consulting men who have returned home after working them.
4. Can you suggest any alteration in the form of dams, or any variation in the terms of existing specifications for such works, so as to admit of a more economical working of such labour-saving machinery? Yes; I think there is a great deal of unnecessary expenditure on the dams at present. The saving which according to my calculations might be effected is rendered impossible by the present specifications. In one case there has been a useless expenditure of £837.
5. *Mr. Donkin.*] Was that in this Colony? Yes. Nor do I consider the present specification right in itself for the purpose for which it is made, namely, the conservation of water. The dam, according to that specification, is too steep in the inclinations. I have been told by squatters of large experience that the sides of the tank will not stand at 1 to 1½, nor do I think the soil of the country will stand anything of the kind. Then, if the sides do not stand, the loss is much greater than the cost of making a greater slope so as to keep them permanent and neat and clean. Then, as regards our machinery, we cannot work the scoop with a slope of 1 to 1½, as it has to come up the slope of the dam to lodge the earth on the embankment.
6. *Mr. Franklin.*] With greater slopes you would get out the earth with greater facility? Yes; you want to reduce the steepness of the slopes from 1 to 1½ to 1 to 3, and that is quite as steep an inclination as will allow the embankments of any tanks to stand, especially the tanks that are open to live stock.
7. *Chairman.*] By what name is your excavator known? As "Fowler's Scoop."
8. *Mr. Donkin.*] It is used with a plough? Yes; you plough first and then use the scoop. The machine was shown in the International Exhibition in Sydney.
9. It is worked by two stationary engines, I believe? Yes, one at each end of the dam. You plough the ground to the depth of 15 inches each time it is used, and then begin to excavate. The longer the machine is acting continuously, the more work it will do for the cost. The machine here at present is in the hands of a good man, Mr. Doudney, who can tell you all about it. I have analyzed his accounts from beginning to end, and find that he did very well in taking out large quantities of stuff.
10. *Chairman.*] Have you had any experience of tank-sinking in other Colonies? No; I have sent machines to other Colonies, but it is only recently that I have heard how they succeeded. The whole business arose from the action of Mr. Peter Waite, Sir Thomas Elder's partner. I worked the machines at Leeds, and sent him four of them.
11. Can you point to any tank which has been excavated by the machine in this Colony? Yes; the tank excavated by Mr. Doudney, for Sloane & Co., on which £837 was uselessly spent in making the embankments mathematically square and finished nicely, which I think is nonsensical.
12. *Mr. Donkin.*] That is not possible to do with this machine? No, nor is it necessary.
13. *Chairman.*] Can you refer to a case of the most successful mode of using the machine? There is only one in this part of Australia. I would refer you to Sir Thomas Elder, of South Australia, or the information can be obtained by writing to Mr. Peter Waite, who manages the whole business there.
14. What number of yards do you think the machine will excavate per day in free soil? About 500 cubic yards on an average.
15. What would that cost? I have not reckoned it up, but I will send you a statement of the actual cost.* At present I do not know the expenditure by Mr. Waite; but I may say that the actual cost of taking

* NOTE (*on revision*):—About £6 per day.

Mr. D. Greig. 1 July, 1884.

taking out the earth will not exceed 6d. per yard, if the machine is kept continuously at work. When the machine is kept standing for any length of time the cost would be something more.
16. You cannot describe the machine well without a photograph? No; but I can send you a catalogue in which it is described.
17. What is the cost of the largest tank made by this machine? £1,800 or £2,000 in this country; I cannot say what Sir Thomas Elder's tanks cost.
18. Is there any shifting of the machinery required to pass the stuff on to the embankment? No, the machine passes it at once, and almost as neatly as if the work had been done by hand.
19. What is about the batter? On the outside whatever may be preferred, on the inside 1 to 3.
20. *Mr. Barton.*] What is the original cost of the machine? I cannot give that; I will let you know what it would be when landed in Sydney.*
21. Then its capacity for working is said to be 3,000 yards a week? Yes, and in proper hands that may be largely increased in summer-time, when we have long days, and the machine does not stop.
22. And the weekly expenses of the working would be about £36? I think about that amount.
23. Is there any separate power employed to take the machine from one part of the country to another, or is the machine fitted to effect the transit? No other power is required. If the Government to-day gave an order to proceed to work at a place 18 miles distant, the machine could be at work to-morrow.
24. Does that mean that it could travel 18 miles a day? On an English road we can do 30 miles; but in the Colony, where the roads are not clear of stumps, the rate would be about 3 miles an hour, with scoop, plough, waggons and baggage, and all things requisite for working the machine.
25. *Mr. Donkin.*] Take as a maximum a 50,000 yards tank, is there any difference in keeping the earth out of the way, as compared with the case of a smaller tank? Not the least.
26. Where does the earth go? At the ends and sides—all round.
27. Is it taken by the scoop? Yes, by means of three wheels centred on an axle. As the earth is deposited, the part of the machine which is nearest the ground spreads the stuff.
28. In the case of a tank of 10,000 yards, with a slope of 1 to 1½ or 1 to 3, you would have a large embankment? They do not ask for more than 10 feet in height. I have suggested the planting of a few trees on the embankment, to make it firmer.
29. In bad weather, or when there are heavy rains, much of the embankment must wash into the tank? We keep it back about 30 feet.
30. In a 50,000 yards tank, you get an immense embankment, which can be seen 3 or 4 miles away? But there is no difficulty about it, if you make the base so wide as to be capable of holding the stuff.
31. I think there has been some unnecessary expense on a dam at Nymagee, on account of the slope? Yes, it was 1 to 1½, owing to which £837 was spent on it unnecessarily.
32. For what purpose? To make it look beautiful. Where there are dams with a slope like that, it is not the custom to let stock get into them; troughs are provided to render it unnecessary.
33. *Chairman.*] You can make the base of the embankment as broad as you like, and spread the stuff as you like? Yes; if we want the embankment as small as possible at the top, with a due height and proper slopes, we take the surplus stuff to the lower end. There is scarcely any necessity for it to be brought to the corners.
34. *Mr. Donkin.*] How do you calculate the area dug out? You calculate it by measurement of the hole. We do not calculate the corners, but take a straight line, and we get the slope at the ends.
35. Have you any interest in any machine at work? No; I have a part interest in the invention, and in perfecting it, and I take an immense interest in getting the machine here to work properly.
36. That is the only one in New South Wales? Yes.
37. *Mr. Gipps.*] Some of these machines are working in South Australia? Yes, six belonging to the Government, and four are working for Messrs. Elder & Co., and one for Mr. H. B. Hughes, Adelaide.
38. Do you know the localities? No.
39. Do you know the dimensions and forms of the tanks on which the machines have been employed? No.
40. Nor the costs of the excavation? I heard that it cost 6d. per yard. I learned that from Mr. Waite's letter.
41. Do you know anything of the strata operated upon? No; it matters little what the strata may be if the steam plough will enter.
42. *Mr. Townsend.*] Do you know anything about the cost of the transit of the machine, as far as the state of the weather might affect it—in very wet weather, very dry weather, or where there is a scarcity of water? In ordinary weather there would be no difficulty; in dry weather there are means of carrying water; in wet weather there would certainly be some little difficulty in getting through bogs, which may add to the cost of movements somewhat.
43. What is the width of the tires? 2 feet 6 inches, or any width you like. The machine in the Colony is similar to that which was in the International Exhibition here. I do not think you need be afraid of moving the machines. We had one which went 500 or 600 miles, at the rate of 15 miles a day.
44. Can the power used for working the machine be used for moving it? Yes; the engines can be used for any purpose where power can be taken off by a belt.
45. *Chairman.*] Do you know what quantity of water and fuel is required for the supply of the machine? If kept fully at work, it will require about 1,400 gallons of water per day, and about 3 tons of wood.
46. In the event of getting away from water, or into constantly dry country—would not that be a great obstacle to the use of the machine? Of course; but the machine has a traction engine that holds 1,400 gallons, which could be used for obtaining supplies. Both here and in South Australia water has been brought a distance of 20 miles to the machines.
47. Have you an agent here to take orders in Sydney? Yes; Mr. Noakes.
48. Have you any machine here now? No; Mr. Bennett has a photograph which I have no doubt he will lend you.
49. *Mr. Donkin.*] In what year did you invent the machine? It is about ten years ago.
50. Was it originally intended for the purpose of excavating tanks? Yes, by Mr. Waite's wish, and we spent £10,000 on it. The patent is in my name and Mr. Waite's.
51. I think they use the plough on railway excavations now? They do. Arthur

* Note (*on revision*):—The cost of the machine, specified as follows, would be about £3165, landed in Sydney, f. o. b.:—Two 16-h.p. patent compound ploughing engines, steel drums, one 4-furrow plough, one patent excavating scoop, water-lifters, wire rope, duplicate wearing parts, &c.

Arthur Hastings Doudney called in and examined:—

A. H. Doudney. 1 July, 1884.

52. *Chairman.*] You know the excavator recently used by Messrs. Sloane & Co.? Yes; I am manager for them in its work.
53. How many machines have you had at work? Only one plant.
54. Have you been long working that? We have had it about thirteen months.
55. Have you sunk many tanks in that time? One, which is a large Government tank.
56. Of what capacity? It is 1,903 yards, and the works in connection with it bring it up to 2,000 yards. The accurate deposit would be 1,974 yards.
57. Where is that situated? At Melrose, between Condobolin and Nymagee. That is the only tank I have excavated.
58. At what expense did you sink that? Exactly 1s. 9d. per yard. That was the contract price, and that is exactly what the tank cost in excavating.
59. Have you any other experience in working that excavator? Yes, I have seen it worked, and was engaged for a time in providing tanks with the plant.
60. In this Colony? At Burrawang.
61. Can you give the name of the person who used it? Yes; Messrs. Edols & Co., at Burrawang.
62. Do you find much difficulty in travelling the plant? No, very little difficulty indeed; the chief difficulty is in getting through heavy sand—that is the only thing that troubles us.
63. The whole plant is drawn by traction engines? Three traction engines are in use. I have travelled with the machine 120 miles.
64. What average can you do per day? 12 miles in timbered country, and 20 miles in plain country. In going round the timber we have to slow down, so as to take care that everything clears the trees, and to be cautious in steering the best course, so that there is a great loss of time in that kind of country.
65. What fuel and water do you use? We burn wood, and the quantity of that and the water will depend upon the work being done.
66. What is the amount of the water and wood usually required? 1,500 gallons of water per day, and the wood is a small amount—about two dray-loads a day. When I had 5 miles to go to draw water for a few weeks I found two trips a day all that was necessary. The wood is a very small consideration.
67. What is the average extent of excavation a day? It depends entirely on the shape of the tank; we found it far better if the bank is not too steep,—then the work is 450 or 500 yards per day, or 3,000 a week; but that I think can be increased. I have been working with the first-idea scoop, but I expect that when the one coming by the "Abergeldie" arrives we shall be able to accomplish 600 yards a day.
68. Does this excavator distribute the earth where you want it placed? Yes; but not only that,—it also spreads the earth along in layers and makes the banks firmer than would be the case if a cartload was just tilted up.
69. Can you suggest any improvement on tank-making—any better method? The tank we made cost 1s. 9d. per yard, and I would willingly do the same work for 1s. 2d. per yard if the slope of the bank, instead of being 1 to 1½, had been 1 to 3, and the banks 5 feet high instead of 9 feet, which extra height is of no earthly use. With the banks reduced to 5 feet and the batter to 1 to 3, I would make the same tank for 1s. 2d. or 1s. 3d. per yard, and at that rate I could make a large profit. With the plant we had we could have made from £180 to £200 a week, which we lost in the end by taking out the corners.
70. What was the depth? 18 feet, but that does not matter in the cost; provided the slope is allowed to be a little shallower we go any depth—to 30 feet if necessary.
71. *Mr. Franklin.*] Would not such an alteration of the slopes allow a greater evaporation of water? It would, and to that extent there would be a loss if the tank was the same depth. But if you go 2 feet lower down, there would be a greater body of water than that obtained in the present specification. The loss of water by evaporation from the surface would be more than compensated by the greater body of water, owing to the 2 feet extra depth.
72. Can tanks be sunk at a greater depth than that in the present specification at less cost? With this plant it would make no difference if the depth were greater, say 27 feet.
73. Is there any reason why tanks should be kept at a maximum of 18 feet depth? No; it was the first idea, and the same specifications have existed for fifteen years. For twelve years I have known tanks to be made on exactly the same specifications, which were framed with the idea of pumping in the water from swamps with centrifugal pumps; but they carried out the specification where there were sandhills and no chance of water lodging there. Yet the same specifications are kept up, and there is the same expense for excavating; they do not alter the shape of the tanks to suit the country in which they are situated.
74. Are you aware that in designs of the tanks in Riverina this depth was established in order to avoid a loss of water through the drift which was ascertained to exist below? No, I am not aware of that.
75. But there would be no objection to going to a greater depth? No objection whatever. With this plant the drift would have to be very bad for the water to get away. In a sand-drift at 15 feet deep a shower of rain fell, of about 10 or 11 points, when the water was only 2 or 3 inches high in the tank, yet not a drop percolated through the sand-drift—there was no soakage. This can be accounted for by the heavy weight of the scoop, the wheels of which harden the ground as they pass over it. This happened in January, in hot weather, when water was more liable to soak away. I thought it remarkable, as we had been ploughing up the sandstone. The scoop weighs about 5 tons, and when loaded would give a weight of 10 tons, which weight continually running over the ground hardens the surface so that no water can escape through it.
76. *Chairman.*] Then you consider that an advantage? A great advantage, especially in drifty country.
77. *Mr. Franklin.*] At what height can the spoil be deposited on the bank conveniently? I can do it up to 12 feet, provided there is a fair run up the bank.
78. That is a matter of detail? Yes. A slope of 1 to 1½ is disadvantageous, and in our case the embankment was 15 feet high in some places.
79. Will the machinery admit of the deposit of the soil on all sides of a rectangular tank? Yes, we deliver anywhere.
80. Suppose a piece of country with a gorge in which we desire to form an excavation in one part of the area so as to throw the water back, how much work could be done by the machine daily? Of course a great deal would depend on the soil; I should say we could give a full average of 600 yards daily, working eleven hours a day. It is an advantage to have the loads coming out all one way. I have been used to take

A. H. Doudney. 1 July, 1884.

an average of six scoopfuls every ten minutes, but after we had got three-fourths of the way down I was glad to get one scoopful in each quarter of an hour; and I have been half an hour getting one scoopful.
81. You draw over the bank as you deposit each time? Yes.
82. So you consolidate each layer? Yes. We had to shift some of the spoil with drays, and we found it so hard that we had to use a pick—we could not shovel an ounce of it.
83. You removed a certain amount of the spoil by the scoop, and where did you deposit it? Outside the bank, which was 15 feet high.
84. In what time? In nine days, in terms of the specification.
85. You deposited it on the slopes in seven weeks? Yes, with three drays and from seven to nine men. In first depositing that dirt I had used the utmost care not to run the scoop over it; yet it made the material so hard that it had to be picked, as it could not be shovelled. I had to cut a flume from the silt tank into the main tank for the passage of water; the depth was 3 feet of sand and loam, in which the engines bogged. When I came away after seven months this was hardened so much that I had to get powder to blast it; this was owing to the engines having passed over it. Among my men, some of whom were navvies, it was considered a curious thing that the weight of the engines would so harden down the earth round the tank. It does away with expensive puddling.
86. *Mr. Barton.*] With regard to this particular tank, what object was there in having an embankment all round it? I could not find out, unless it was to break the action of the wind on the water, as has been stated.
87. There was no object at all to be served? No—they own that. I suggested to break the action of the wind by big stakes with wicker-work, but they would not allow me to do it.
88. What would be the best shape to sink, and the best batter so as to work your plant to advantage? The best batter would be not steeper than 1 to 3, and the shape may be that which will best suit the ground. It may be oblong, square, horse-shoe form, or circular, as some are in Riverina; it does not matter which. Sheep generally run round a tank and are likely to bog in the corners, so some tanks are made round in order to avoid corners.
89. You estimate the capability of this excavator at 3,000 yards a week? Yes, with everything in good order.
90. Then how came it to take seven months to excavate 20,000 yards? There were difficulties with the men, and I had great trouble with the specification, squaring all the corners down, making the sides of the tank like the walls of a room, and trimming the banks, which the Road Superintendent laughed at. In a short time the work of trimming these corners could not be seen.
91. What number of men does it take to work this plant? Eight men with the working manager—which place I take myself.
92. That is a total of eight men when the plant is in full swing? Nine with the manager. It would take nine men, but I work with eight, reducing the number by one by acting myself as working manager.
93. Are these men only ordinary labourers, or are they mechanics? With the exception of one they are ordinary labourers. I found it better to get ordinary bushmen than to get engine-drivers from town. It is better to have the experienced man to break in the bushmen, who are more contented with the life in the country.
94. That one then is an engineer? A. fitter.
95. I believe you took the engines and scoop from Sydney to Burrawang? From Burrawang they were brought from Mr. Edols' establishment, and I took them to Melrose, to Messrs. Harden & Co.'s station, a distance of 83 miles.
96. How long did it take you to travel those 83 miles? I was steaming five days for the 83 miles. We broke the axle against a stump, and it took two days for a blacksmith to mend it.
97. As to this tank you sank at Nymagee? It is 65 miles from Nymagee and 45 from Condobolin. It is 5 miles from Melrose homestead.
98. Did the Messrs. Edols & Co., of Burrawang, sink any tanks with this plant before you bought it? They had put down eight tanks I believe.
99. Do you know what their capacity was? They were from 7,000 yards to 15,000 yards; that is as far as my knowledge goes.
100. Do you know the depth of them? 15 feet one and 12 feet the others. I know they shifted from one tank to another 8,000 yards away within a fortnight.
101. You gave some evidence just now in reference to tanks sunk in Riverina many years ago; I think that evidence was calculated to mislead the Commission; you seem to suppose that the average depth then was 18 feet? For the Government tanks only.
102. I think you say you can sink a 30-feet tank without extra expense? They have been sunk 27 feet in South Australia without further expense, but I cannot tell what the batter was—I think 5 to 1.
103. Do I understand that you can sink 30 feet with a batter of 1 to 3 without extra expense? As the depth increases we should require a longer slope. If you go down 30 feet we should require a slope of 4½ or 5 to 1.
104. What batter would you require when 10 feet down in sinking a 30-feet tank? We should require 1 to 5 right through.
105. You start with the same batter? Yes. We might be able to do with less, but I know that the deeper we went the steepness of the batter became more inconvenient.
106. *Mr. Donkin.*] You state that at Burrawang seven or eight tanks were sunk with the machine? Yes.
107. What batter was used then? 3 to 1 always.
108. Is that for the sides and ends? Mr. Edols showed us batter of 1½ to 1 in the sides; the ends were always 3 to 1—never steeper.
109. Generally the batter is 3 to 1 all round? Yes.
110. Are the tanks for the Government fenced in? Yes.
111. As to the cost of carriage, do you know whether the engines went from Sydney to Burrawang by road? They went from Sydney to Orange by rail; thence by road to Burrawang. The difficulty then was owing to the inexperience of the men in charge and their inability to find water. The engines had not then the winding drums which they have now, so that if an engine is bogged a rope is fastened on, and, anchoring to a stump firm in the ground, the engine can help itself out of the bog.
112. What was the distance of your embankment from the edge of the tank? 30 feet.
113. What was the slope of the embankment? 1 to 1½.
114. The same as that of the tanks? Yes.
115. Was there any object in that? None that I can conceive.

A. R. Doudney. 1 July, 1884.

116. You say it took you seven weeks to remove a quantity of earth over the embankment, and that it took seven men to do the work; what was the object in doing that? They compel us to have the bank uniform—the same slope, width, and depth all round, and I had it as I considered uniform. The consequence of this requirement is that you never know when the bank is finished. They compelled me to round the embankment.
117. If this embankment is all round the tank I suppose it is 15 feet high? Only in one place.
118. How did the water get into the tank? Through the flume from the silt tank.
119. Is the tank full? No. They have very expensive woodwork, and wanted a kind of apron put in the bottom of the tank—a regular platform for the water to come on to it; whereas if they used some sheets of corrugated iron it would have the same effect.
120. Do you think the tank would ever fill? I think never except after heavy rain.
121. To what depth do you think it will fill? About 2 inches of rainfall in a heavy storm may put 2 or 3 feet in it.
122. It is never likely to be of much use—never likely to be full? No.
123. Were the tanks at Burrawang made in the same way better off? No. I think the squatters found that the surface-water was not worth bothering about—it percolates away. They looked for more from excavation, and made very nice tanks with tastefully finished corners with the plant alone.
124. The hard stuff which was put round the Government tank, the excavation of which you superintended, I suppose was put there to protect the tank from the wind? They say it is for that purpose.
125. Was this tank in level country? Yes.
126. You could see the embankments from a long distance? No, it is amongst thick pine scrub.
127. Is the soil decomposed granite? Yes.
128. Did you get any granite in sinking? No; we got cement, gravel, and sandstone, which I could plough.
129. What quantity is the scoop capable of removing at each time—I suppose the small scoop holds about a ton? The scoop we use holds 3½ cubic yards.
130. *Mr. Gipps.*] Suppose I wanted to make an embankment 30 feet high, would the scoop deposit each layer evenly over the whole surface of a base 170 feet wide? We should be in want of sufficient earth.
131. What is the height of each layer? About 8 inches.
132. A course is made of each layer? Yes; they are deposited one on the other.
133. And the weight of the machine consolidates each layer? Yes; and each layer with the others.
134. In forming an embankment you bring the machine on each layer, so as to incorporate one with the other? Yes; that is done by the four wheels. The weight passing over consolidates the ground. The Queensland Government wanted to cut through an embankment, and found it almost impossible with picks and shovels.
135. Do you think it would be possible then to raise an embankment 50 feet high? Quite possible, provided the bank was wide enough to allow the engine to go on it. The engine would be on the outside of the bank after laying the dirt; three drays would be required, and they could not get up there supposing the bank to be made the width of the engine, and to be several feet high.
136. You mentioned that water percolated through a stratum of sand: what was the character of the sand—what was its colour? It was a grey sand.
137. A free sand? Yes. I scooped it up without ploughing it. I could plough it a foot, but the scoop would take up 2 inches more.
138. What is the cost of working? Wages only, £18 10s. a week.
139. And the cost of fuel? Included in the cost of wages, about £2 a week.
140. And what is the cost of wear and tear? The firm have been allowing 10 per cent., but I find that the depreciation does not amount to more than 2½ per cent.* The engines are well built and strong.
141. That is 10 per cent. per annum? Yes. £10 a week of that would go to capital account, 10 per cent. being to that extent in excess of depreciation. There is twenty years life in the engines. They have been used longer than that in the old country.
142. *Mr. Townsend.*] Does the price you mention for wages include supplying the plant with water? Yes. We have besides the two winding engines a traction engine.
143. *Mr. Donkin.*] What is that for? For drawing wood and water.
144. The traction engine ought to be able to get through light scrub? So she does; trees would have to be 6 inches through to stop her. With one engine I travelled 84 miles in 3½ days of steaming, and carried 7 tons of loading and some passengers, and it was a very bad road between Overflow Station and Melrose, where there were many awkward creeks. The engines then were not in good order.
145. Are the tanks you have referred to on this or the other side of Melrose? On the other side. There are seven tanks between Nymagee and Condobolin.
146. Did any one take charge of the tank you excavated? There was no one who would take charge of it. We have finished it, and cannot get the money for it.
147. What was the total cost? I think we were to get £1,750. It has been measured by the road superintendent, Mr. Adams, and there may be some difference between his and my measurement.
148. What was the object in putting a tank there? I do not know. The bank is too steep for stock, and none go that way. They go by way of the Bogan now. At this place there is no feed; it is all pine scrub, and is not a used stock route to anywhere.
149. You had some rain when you were there? Yes.
150. What was the effect of it on the batter of the dam? It was all washed down. Gutters had been formed in the embankment, and when the rain came the wash from these gutters cut the earth away and carried it into the tank. Where it had been 18 feet deep in the corners it became only 15 feet deep.
151. If it had not been taken over from you, you would have had to keep it in repair? I have to do it.
152. *Mr. Franklin.*] For how long? Only until they take possession of it.
153. *Chairman.*] Are these tanks mostly in flat country? Mostly they are.
154. *Mr. Donkin.*] How long will it take to fill this tank? I do not know. No levels were taken.
155. What is the height from the top of the embankment to the bottom of the tank? 28 feet. We could have gone 30 feet.
156. *Chairman.*] If the conformation of the country would suit it and the tank was on a high level and not fully closed in it might be utilized? Yes, if that kind of country could be obtained. 157.

* NOTE (*on revision*):—I have thought this matter over, and conclude it would be safer to allow the depreciation to remain at 10 per cent. per annum. An accident to the machinery would thus be provided for.

A. H. Doudney. 1 July, 1884.

157. In the flat country the embankments would be useless? Yes.
158. *Mr. Donkin.*] Have you had a large experience among tanks? Seven years' experience of Government tanks and private tanks. I was a surveyor in the Telegraph Department, and made the subject of tanks a study for many years.
159. *Chairman.*] Which Telegraph Department? That of New South Wales. I was always constructing lines in the back country, and studied the subject of tanks with a view to becoming a contractor. That is how I came to understand them before having this plant.
160. *Mr. Donkin.*] Have you had any experience of private tanks with embankments all round them? Yes.
161. Of what depth? Up to 10 feet.
162. But only where water can be pumped in? Yes. In some cases the tank is in the shape of a horseshoe, with the dirt thrown round its closed sides.

THURSDAY, 3 *JULY*, 1884.

Present:—

MR. BARTON, M.P.,	MR. GIPPS, C.E.,
MR. DONKIN, J.P.,	MR. LYNE, M.P.,
MR. FRANKLIN, C.E.,	MR. MURRAY, M.P.

W. J. LYNE, ESQ., M.P., IN THE CHAIR.

Henry Chamberlaine Russell, B.A., Government Astronomer, called in and examined:—

H. C. Russell, B.A. 3 July, 1884.

163. *President.*] You are the Government Astronomer? Yes.
164. You have obtained and kept records of the rainfall of the Colony for a number of years? Yes, since 1870. I was appointed Government Astronomer in August, 1870, on the death of Mr. Smalley. At that time there were only five meteorological stations in the Colony. Mr. Smalley discontinued a number which had been in operation before he came to the Colony; but when I was appointed to the office which I now hold I immediately endeavoured to increase the number of stations, taking up all the old ones and establishing a number of new ones. I at first experienced a great difficulty in enlisting the sympathy of those who should have been most interested. The mere publication of the rainfall table did not attract sufficient attention—persons did not read the table; and it occurred to me that it would be well to make the record on a map. In 1878 I published the first of the rain maps, and since that date I have not had the slightest difficulty in increasing the number of contributors. There are now upwards of 400 persons contributing to the rain records. I am sorry that I did not commence this plan earlier, but I did not think of it before. Since 1879 I have been collecting records of the height of the river at Bourke, Wilcannia, Menindie, Pooncarie, and Wentworth, on the Darling; Wagga Wagga, Hay, and Balranald, on the Murrumbidgee; and Albury, Moama, and Euston, on the Murray. I have published these heights with the rain records on the rain maps. The maps have shown the river heights at these points. Mr. Moriarty kindly offered to give me the records which he had kept. I do not know when he began to keep these records, but the earliest record which I have received from him is for 1872. I will give to the Commission a list of the papers which I have received from the Department of Harbours and Rivers (*Appendix A* 1); you will then see to what year the records apply, but it will be observed that they are not consecutive. Since I appeared before the Commission last week I have made inquiries at Albury, at Dubbo, and at Bourke. The reply which I have received from Bourke is that there are no records prior to 1879, the year in which I commenced to publish them, and when of course any person could obtain and keep a copy. From Albury I received the same answer. The only records of which I can hear at Dubbo were kept during the time when the railway bridge was being erected, or during about three years. These of course would be definite measures. I learn by letter from my observer at Dubbo, however, that he will be able to obtain the records a long way back. The difficulty which has occurred to me as to all these records is that the velocity is wanting. I dare say a section could be taken at many places, and I have no doubt that wherever there are bridges there will be sections, but I cannot hear of any records of velocity.
165. What information have you prior to the year 1878, the date on which you commenced to publish the maps? I have the rain records for some places in the Colony as far back as twenty years, but the great majority of the records have been kept only since the year 1870. Every year the number has increased. I have here a statement showing the monthly elevations of the river at Moama, from 1863 to 1883 inclusive (*Appendix A* 2), the monthly rainfall at Deniliquin during the same period, with a break of two years, 1866 and 1867, for the reason that I have already explained—that Mr. Smalley discontinued the observations (*Appendix A* 3). The statement also shows the rainfall at Albury from 1863 to 1883, with a similar break in the years 1867, 1868, and 1869 (*Appendix A* 4). I have also brought with me a number of rain records. I have the record for Brewarrina from 1872 to 1883 inclusive; for Armidale, from 1870 to 1883; for Narrabri, from 1871 to 1883; for Bourke, from 1871 to 1883; for Inverell, from 1874 to 1883; for Bathurst, from 1870 to 1883; for Dubbo, from 1870 to 1883; for Mudgee, from 1870 to 1883; and for Orange, from 1870 to 1883 (*Appendix A* 5). I have selected these towns as bearing upon the rivers, and it is the best information which I can give the Commission as to the rainfall in these places. Further information can of course be obtained from the rain and river records.
166. I think you have at various times read before the Royal Society papers in reference to these matters? Not many; most of what I have had to say has been published in the rain maps and in the papers. The first occasion on which I called attention to a matter which has been engaging my attention for some years—the difference between the rainfall and the discharge of the rivers—was in 1879. I read before the Royal Society a short paper in reference to the river Darling and the water which should pass through it. The paper is dated August 1st, 1879. You will observe a connection between this date and the statements which I have already made. I began to keep the river records in 1879, and as soon as they came into my hands

hands I saw that the rain and river records did not accord. I wrote a short note calling attention to the fact, and showing that the water which passed down the river Darling was so small in quantity as to be utterly insignificant when compared with the rainfall. H. C. Russell, B.A. 3 July, 1884.

167. Will you kindly put in that paper with your evidence? Yes. I have on one other occasion since 1879 read a paper before the Royal Society; it was a paper upon Evaporation, but that does not so much affect the question. The observations, which had the effect of bringing the matter under the notice of those who took an interest in it, were made in connection with the rain and river observations in 1880 and since. I then said—"The width of the river at Bourke is 180 feet, and the velocity when in flood is rather less than 1 mile per hour. A few figures, which I need not give here, suffice to prove that $\frac{1}{4}$ of an inch of rain over the watershed, or $\frac{1}{10}$ part only of the rainfall, represents all the water that passed Bourke during the whole year." Several writers in the public Press, and others who communicated with me privately, took considerable exception to the statement which I then made that in such a country a third of the rainfall should be available. I am not an engineer, but I have taken the data for my statement from various engineering works. I find that in England the quantity of the rainfall passing down the rivers varies from 30 to 50 per cent.; in Germany the average is from 40 to 50 per cent. Mr. Coglan, C.E., when reading a paper before the Royal Society, estimated that in the coast rivers the average was 44 per cent., varying from 52 per cent. in wet periods to 10 per cent. in dry seasons. He is of opinion that something like 25 per cent. of the rainfall ought to pass down the western rivers.

168. Have you any information as to the quantity of rainfall which passes down the rivers in California? No. I have some of the rainfall records of California, but I have none of the river records.

169. It seems to me that the circumstances of California in regard to the rainfall nearly approach our own circumstances, and I thought that if we could obtain any information as to the disposition of the quantity of water passing down the rivers, it would be of value by way of comparison? I do not know of any such records, but there is a very good collection of American publications in the library of the Royal Society. It would be easy to consult these books; and I may mention, for comparison with those records, that in the rain-map for 1880 I pointed out that there were forty-five rain stations on the Darling watershed, and the average rainfall derived from them is 20·74 inches. This refers to the upper part of the watershed, about 110,000 square miles; and the average height of the river above summer-level was 6 feet 8 inches. This represents only $\frac{1}{4}$ of an inch of rainfall over the watershed. In 1881 the average rainfall for the same district was 18·88 inches, and the average height of the river only 9 inches, which represents a quantity of water equal to a rainfall of only 0·028, a quantity so small that it is quite insignificant. Similar facts will be found stated in the rain-maps for 1882 and 1883. I understand summer-level to mean that height of the river at which it just stops running. Since then a new gauge has been put up about 4 feet above this, and that is called navigation level—I do not know on what authority. I have not put up this gauge—I think Mr. Moriarty may have done so—but the records have been sent to me, and I have kept them.

170. What do you think becomes of the water which is not accounted for? The chief information I have had is derived of course from the rain and river measures; but I have for some years past been in the habit of collecting information from other sources tending in the same direction. I may mention a few of the facts which have come within my knowledge. In the Wimmera district, in Victoria, at a place called Saen, a well was sunk; at 250 feet from the surface the bore cut 6 feet through a tree, and a great many fruit-stones, similar to the nut plums now growing, were brought to the surface. At a further depth of 130 feet such drift as is usually found in gold mines was discovered. It is evident therefore that in this district, which may be regarded as the southern edge of the basin of the Darling and Murray Rivers, there are alluvial deposits at a depth of 400 feet. Coming north from that district, at the Goree run, near Narrandera, on the Lachlan, in sinking a well, at a depth of 80 feet boulders and other indications of a large river-bed were found. A man turning over one of the stones found a frog. On examination it was found to have no mouth, that is to say, the mouth was closed beyond recognition. The frog was put into fresh water, and in the course of a few days the mouth opened; in about a week the frog died. I remember that at Dubbo when the piers of the bridge were being sunk there were found at 85 feet from the surface trees which had evidently been in an old river-bed. All over the Dubbo flats good water is found in river drift at from 40 to 50 feet down. I was in Dubbo in March of this year. The river appeared to have stopped running; for a considerable distance, some 60 or 70 yards, there was a dry bank extending across it. Just below the bridge, where a wool-washing place has been established, I stood looking into the river, which, as I have said, appeared to be stagnant. The dirt from the wool-washing operations, however, instead of distributing itself evenly round about the place, was being carried down, and the curve showed that there was still a current in the river, although, as I have explained, there was a dry ridge extending across it. It was quite evident that there was a current of water passing in the river drift. From the Macquarie, near Dubbo, sufficient gravel to ballast a railway line for about 100 miles has been taken out, showing that there was practically an unlimited supply of gravel wash. This would seem to have been a characteristic of the river for many ages. The gravel becomes covered with a muddy deposit and is left below, the water eventually percolating through it. In the Castlereagh River a great deal of sand and gravel is brought down. More than half of the course of the Castlereagh is now filled up with drift, and running parallel to the Castlereagh there is a place called the Monkey. It is very well known in the district, and in it, at all times and seasons, water is to be obtained by sinking a small distance. This water is found in a river drift.

171. Does that run parallel? Parallel to the Castlereagh; water can be found in it at all times. It is further evident from all I can hear that it is an old bed of the Castlereagh, which has been filled up by exactly the same process as that which is filling up the present bed of the river. Mr. T. K. Abbott, now Police Magistrate in Sydney, made it his business to collect the records in connection with wells on the Liverpool Plains. He has records, I believe, of over 200 wells. A great deal of the information which he obtained was read in a paper before the Royal Society. But Mr. Abbott has collected some further information, of which he has told me. He tells me that he has found what he thinks is positive proof of an old river-bed at 80 feet below the surface, running across Liverpool Plains. In this bed the water was running abundantly in an old river drift. That appears to be only another stage of the process which is going on in the Castlereagh. To the north-east of the Darling, at Bourke, there are indications of another river-bed, from which gravel and ordinary river drift have been obtained. I think we have sufficient evidence that these rivers have choked themselves, and have gradually formed new beds. The

old

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old river beds, found as I have said at various depths, and being full of gravel, afford a sufficient drainage to take away the water. There are one or two further facts of an interesting nature which I may as well mention here. At Dunlop Station, about 100 miles south-west of Bourke, in sinking a well at a depth of 300 feet, they passed through a sort of slate composed of sand, wood, shells, and dead fish, packed so hard that is was necessary to blast the mixture. Under this mixture a tree 18 inches thick was passed, and at 143 feet further, or 443 feet from the surface, another tree was found. These facts bear out my description of the character of this part of the country. Higher up the river there is evidence of an old river action at various distances below the surface, and here an abundant supply of water was found in other wells at 480 feet from the surface; it came up from river drift in great abundance. More recently, so I notice by the papers, a well has been sunk on the Tooralie run, and at 82 feet from the surface an abundant supply of water was found in a drift composed of granite, pebbles, and boulders; and near Hungerford's another well came into an old river drift, containing shells, lignite, stones, &c., 120 feet from the surface. These cases seem proof of river-beds at various depths. Further down the Darling we have the same occurring near Wilcannia. Water is there found in some sort of drift, and there are a number of other facts of the same character, which induce me to think that the old river beds form a means whereby a great deal of water gets away. I know that exception is taken to that view. It is supposed that water cannot percolate very fast through sand and gravel; but on the other hand, it is quite evident that the strata in the upper parts of the Darling country are permeable, and are of that character which will let the water into the ground. It is also evident that the rainfall is not accounted for in the rivers, and it is only fair to assume that it sinks down into the strata somewhere, and it cannot continue to accumulate indefinitely below—it must run somewhere. Every year there is a certain quantity of rainfall, and every year a certain quantity of water must sink into the ground, run away by some underground drains, and I think I have shown that some buried river-courses exist, and as compared with the extent of the country very few wells have been sunk, it is fair to assume that there are many more old river-beds as yet undiscovered. This disappearance of the rain-water has continued for so long a period that no storage of any capacity could possibly account for the water. In South Australia, in latitude 29°, just north of Farina, water has been found in abundance at a distance beneath the surface of 1,220 feet, and this seems from its depth to prove that the drainage goes west, for the wells are deeper as you go west.

172. *Mr. Donkin.*] That is about west of Dunlop's station? Yes. These are some of the reasons which induced me to suppose that the water must get away. No one else was writing upon the subject, and I felt that some one ought to take up the matter and to keep it going. With reference to the quantity of water which escapes in this manner, I do not think we have means which will enable us to give a definite answer. In England it has been shown that one-third of the rainfall in some districts sinks down to underground drainage. The quantity of the rainfall is measured, and from a section of the river at Bourke, taken many years ago, with known velocity I have ascertained the quantity of water passing away in the Darling. I do not suppose that the section is likely to have altered very much in the interval, but in order to get a complete answer to the question—where the water disappears, we want a number of properly made sections higher up the rivers, in each branch of the river in fact.

173. *President.*] Have you ever heard, or have you any information which would lead you to suppose that there is a discharge of this fresh water into the sea? Yes; in the western district of Victoria a considerable stream of water has been found to the south of Wentworth—I forget the exact locality,—but this water is running away towards the sea. The river is in a limestone formation. It is pretty evident on our east coast that the water gets away through the sand. On the coast to the westward of Adelaide, away towards Western Australia, there is no surface water whatever to be found. There is a considerable rainfall at Adelaide, varying, I suppose, from 20 to about 30 inches a year. We may assume that, as the land on the coast to the eastward is in the same latitude as Adelaide, the rainfall there would be similar; yet, as I have said, no surface water is to be found. The water cannot find its way into a big hole—it must get out at some point. There are some curious facts bearing upon this question. In the low peninsula of Florida, rivers, which must have their sources hundreds of miles distant, come out of the earth in volume sufficient to permit steamboats to go to their basins of irruption. In January, 1857, a submarine fresh-water river burst up from the bottom of the sea, near the south end of the peninsula, and for a whole month discharged a current not inferior in volume to the river Mississippi, or six times the volume of the Nile. This water comes from the country which is drained by the Mississippi. It is pretty evident that the water does not find its way into the Mississippi, which is, one would think, a sufficient drain for all the country. As our investigations proceed, I think that something of the same kind will be found here.

174. Have you ever heard it asserted that, at a considerable distance at sea on the Victorian coast, fresh water is to be found? I have never heard that said.

175. *Mr. Barton.*] You have perhaps heard that there is an enormous discharge of fresh water into the sea between Port Lincoln and the Great Australian Bight? I have heard of it, but I have received no particulars—I have heard only the general statement. In the country between the coast and the Gawler ranges people can tell exactly the depth at which an inexhaustible supply of water can be found. To my knowledge, if you sink a well at a time of heavy rain in this country the water will rush down it, bringing with it all sorts of rubbish and débris, and within ten minutes of the stoppage of that rush the water becomes perfectly clear, and remains at exactly the same height in the well. Endeavours have been made to reduce the depth of the water by means of pumps and other appliances, but it cannot be lowered a quarter of an inch. These wells may be found at intervals for a distance of 300 or 400 miles down the coast.

176. You have no information upon this point? I have only a general knowledge of the question.

177. *President.*] Have you any information as to wells which are not in the neighbourhood of rivers, but which are situated between various rivers in the Colony—between the Macquarie and the Castlereagh, for instance? I have a good many notes upon that question, which I will be glad to produce for the information of the Commission on another occasion. There is one fact which I intended to mention just now, with reference to the sinking of a well at Sale, Victoria. When the water was first discovered it came up quite black with leaves, dead timber, and rubbish of that kind, showing that the water must have rushed through some open space; because if that were not so the leaves and other débris would not have been contained in it. What I mean the Commission to understand is, that the water must have passed through holes large enough to admit leaves, pieces of wood, &c., and therefore, sufficient to let a great deal of water pass.

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178. The flow of water continued in that condition for some days, I believe? Yes, several days, and an enormous quantity of rubbish was brought up. With reference to the Murray River, I should like to put in a long letter which I have received from the late Mr. Gell. (*Appendix* A 6.) He has also sent me some valuable information which he obtained in reference to the river. He kept a record for a number of years at Lake Victoria, and he has sent me a tabular statement in connection with the Murray River, from August 12, 1871, to August 12, 1874 (*Appendix* A 7.) He has also sent me a diagram showing the Murray River measures from 1871 to 1876, made at Ki (*Appendix* A 8); and a further diagram, showing the Murray River measures at Lake Victoria in the years 1863, 1864, 1866, 1867, and 1868 (*Appendix* A 9.) I think the Commission will find that these diagrams contain very useful information. I understand that the Commission desires some information as to the quantity of water falling at a particular time, and the effects of that rainfall upon rivers. One of the most marked instances of a flood occurring from a particular rainfall was recorded in February last year, on the Darling. I commenced to plot upon the map the rainfall which caused it, and which had fallen upon the Macintyre and mountains near it; but, upon further consideration, I found that I had not sufficient data for tracing the flood-waters from where they fell down the river, and that no satisfactory result could be obtained. I know nothing of the sections of the river above Bourke, or of the velocities of the current. I find that sections of the river were made at Brewarrina and at Walgett by the Department of Harbours and Rivers; but beyond this I can obtain no information upon the point.

179. If you could obtain these sections of the river and the velocities, would it assist you in giving us some further information in reference to the effects of the rainfall at that particular time? Of course I could work it out, but I should not care to do so. I think that is more in the nature of work for an engineer. For instance, the average velocity of the stream on the surface might be taken; but I know perfectly well that engineers have very different opinions as to what the actual velocity is. It depends upon where you measure the current, if you want to be particular.

180. *Mr. Donkin.*] I believe experience shows that the general velocity of rivers in the level country is about 1 mile? Yes. There is a little discrepancy in the measures given me by Mr. Moriarty. The velocity of the river at Bourke is shown at one and a half mile per hour. There are other measures of the velocity of the river made in a 30-foot flood, and these velocities show it to be something like two-thirds of a mile per hour. Taking the instances of high floods, and noting the time the flood-wave takes to get from Bourke to Wilcannia, I find that the velocity differs very much. In 1879 the velocity was 2·1 miles per hour; in 1880, 2·1 miles; in 1881, 2·0 miles; in 1882, 2·5 miles; in 1883, 2·2 miles. The rate of translation of the wave varies with the rate of rainfall. In 1882 the rainfall was very heavy, the rise in the river rapid, and the motion of the flood-wave faster than usual. I can give a few particulars of the progress of the flood resulting from the heavy rain which fell on the Macintyre. It reached Wilcannia on March 1st, having passed over 535 miles at the rate of 2·2 miles per hour—Menindie in six days, at the rate of 1·7 miles per hour. Of course after the flood-wave has stopped the velocity would not be so great.

181. The higher the flood, I believe, the less the velocity? It does not appear so.

182. *President.*] You can give us no other information as to the velocity of the river? No; of course, in reference to the velocity of the flood-wave—that is, the translation of the flood or first rush of the water—a great many measures have been taken by the Department of Harbours and Rivers.

183. You have no further information which would be of use, as enabling us to determine where the water escapes to at the heads of the Darling, either on our side or on the Queensland side of the Border? The best information on that subject of which I am aware is contained in Mr. T. K. Abbott's papers in reference to the wells on the Liverpool Plains, but it deals with a comparatively small area. I have some notes which I will bring to the next meeting.

184. Can you give us any information as to what are known as "mud springs"? On the Gilgoin Run, not far from Brewarrina, there was one of these mud springs. It was known as the Cuddy Spring; there was a slight depression of the surface, and the ground was always a sort of bog. The proprietor of the run at length determined to fence it in, in order to prevent the cattle from being bogged there, but it occurred to him that he might as well make use of any water which could be obtained from it. He set some men to work, and an excavation was made. In the first place they came across the bones of bullocks, underneath these were the bones of kangaroos and various extinct animals, and at 27 or 28 feet such a quantity of water was obtained that the men were driven out, and the well has since afforded an abundant supply. The blacks have a tradition which seems to point to the fact that the source of supply is the Darling. The tradition is to this effect,—that there is an underground current of water; whether it is an old creek which has been filled up I do not know. North and west of the Darling, in a line nearly parallel to the river, there are many others—most of them to the west of Bourke. The theory has been advanced that there is a long dyke or other geological formation which causes the water to come to the surface here, but I have no particular information about it. In many other cases attempts have been made to obtain water out of these mud springs, but the only successful instance of which I heard was that on the Gilgoin Run. In some cases water has been found by sinking wells pretty close to the springs. In most cases attempts to sink wells led to an overflow of mud which cannot be managed, and no water is obtained.

185. Have you no idea as to the direction which is taken by the water from some rivers which lose themselves before they reach the Darling? I know that they sink into the ground. For instance, the Paroo seldom or never reaches the Darling. I do not know what becomes of the water; that is a question which can only be answered when the geological formation is understood. It is a fact that water is running generally in the Macquarie and other rivers, and that it only reaches the Darling in flood-times.

186. *Mr. Barton.*] Did you say lignite? That is the description given in the papers. My own impression is that this well must have struck an old channel of the Darling. It is quite evident from the map that the drainage has been in a line something like the Darling. I believe that these mud springs are formed by water coming up from an old channel.

187. *Mr. Donkin.*] Have you any reports as to the mud springs in Queensland—they are much more prevalent there? I have no detailed information. I should mention to the Commission that I have received from Mr. John Wright a great deal of information with reference to the western rivers. I produce, for the information of the Commission, a pamphlet read by Mr. Wright before the Engineering Association of New South Wales. In this pamphlet Mr. Wright says:—"The following figures will, I have no doubt, surprise many members, but I can guarantee their accuracy. The construction of two weirs in a watercourse upon the west bank of the Darling River, at a cost of £2,990 each, would impound

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7,000 millions of gallons of water (sufficient to supply the city of Sydney for five years), cover at flood-level an area of about 14,000 acres, extend back from the river 18 miles, and give a water-frontage of about 61 miles, the weirs being respectively 17 and 21 feet in height, and 93 and 104 feet in length, and 8½ miles apart. In another place a weir 60 feet long, 16 feet high, costing about £1,700, would throw the water back 16 miles, and impound upwards of 1,000 millions of gallons of water, and give about 70 miles of water frontage."

188. Mr. Wright was in this country for some years, I believe? Twenty years, I think.

189. I believe that he has given some information in reference to evaporation? Yes, he has given a great deal of information on that subject. He was employed by Sir Thomas Elder and a South Australian syndicate, and he has furnished some very valuable records in reference to evaporation. He told me that some years ago, when he was in the dry country, he saw a statement in the papers to the effect that Mr. Todd, the Government Astronomer of South Australia, had stated that the evaporation at the Adelaide Observatory was 6 feet per annum. Mr. Wright's impression was that that statement was exaggerated, and he determined to make an experiment in the dry country in which he was then situated—about the latitude of Bourke, I believe. He filled up a tank made of sheet-iron 10 feet 6 inches square and 1 foot deep. The result of the experiment showed that in three years the average evaporation was 98 inches; he came to the conclusion, therefore, that Mr. Todd had not over-stated the evaporation which took place at Adelaide. Mr. Wright made a number of other observations in regard to tanks on stations not far from this spot, and he says that the evaporation in these places was about 50 inches. The record kept at Bourke gives about 7 feet or 84 inches. Many squatters, writing to me, say that in the hottest months of the summer evaporation goes on at the rate of about 1 foot per month for about three or four months. Since the discussion upon this subject was initiated I have received other letters from gentlemen resident in the country, telling me that this is an over-estimate, and stating that they do not believe the evaporation to be more than 3 or 4 feet in the course of the whole year. I have been anxious to obtain some more accurate results, but for want of means I have been unable to take any action in the matter. I believe that £300 has been voted for the purpose of making experiments, but as the Appropriation Act is not yet passed the money cannot be touched. Exception has been taken to the means which we employ to measure the evaporation in the interior. It is said that it is absurd to measure it from metal vessels placed on the surface of the ground, but the conditions under which evaporation takes place are so various that you cannot get two cases which are exactly alike. You must adopt some means of measuring; if you measure from a waterhole you cannot tell what goes out of the bottom of it, and, from many points of view, I think the method of weighing a vessel containing water is more convenient. A difficulty presents itself, as soon as one attempts to measure by a graduated scale, and that is, that a man, in order to measure a depth accurately must have a certain amount of training. But almost any man can weigh water accurately. That method was adopted by Mr. Smalley. The observers were required to weigh the water every morning, and the differences from day to day show the amount of evaporation. There has been kept for about ten years a comparative examination between the evaporation from a vessel placed on the surface and from a vessel sunk into the ground; both vessels were carefully measured every day, and it was found that there was a definite ratio between them. The one on the surface of course evaporated a larger proportion of water. At some periods the evaporation from a tank in the ground is greater at night than in the day. That is of course owing to the heat radiating from the ground. The radiation of the heat carries the water up with it. The general impression in the country is that a less evaporation from a large body of water takes place; that is a point open to discussion. My impression is that it will be found that the reason there is a less evaporation from a deep tank is that it is low, and is not exposed to the effect of the wind.

190. *President.*] Is it not a fact that there is less evaporation from a deep than from a shallow tank? If there is, the reason is I think not to be found in the quantity of water, but from the fact that the water is lower down, and is sheltered from the wind.

191. What is your opinion with reference to tanks made in the dry country for the use of stock: suppose they were covered with wood, would the evaporation cease? If they were covered with wood I think the evaporation would practically cease. Of course if they were completely covered there would be no evaporation. I suggested some time ago that this would be an economical way of saving the water, but the natural reply to my suggestion was that there were no means of carrying out the plan in the back country; that is to say, the available means were not sufficient, and it would not pay to do it. I will hand in for the information of the Commission some letters in regard to evaporation, which I wrote in the course of correspondence on that subject, in the columns of the *Sydney Morning Herald*. The Members of the Commission will observe that there are one or two of those letters wanting, but it will be easy, from reference to the dates of the letters which I now hand in, to supply these omissions.

192. The information you give as to evaporation refers, I suppose, to the direct evaporation from a clear surface of water? Yes.

193. Can you give us any information as to the evaporation after rainfall on the salt plains of the interior? No; I have been for the last twelve months making experiments at the Observatory, showing the evaporation from the surface of soil on which there is nothing growing, and from a surface covered with grass. I find that the evaporation from the surface covered with grass is very much greater during windy weather. It is curious that though there is a certain amount of rapid evaporation from the earth when the soil is wet, very much more rapid than from water, yet, as soon as it becomes superficially dry and caked, the evaporation almost stops, although there is plenty of water below.

194. *Mr. Gipps.*] What was the depth of soil on which you made these experiments? 7 inches.

195. Have you heard of Greaves' experiments in England, extending over a period of fourteen years? I believe that they were made from dripping gauges. The experiments were made, I think, on a depth of 3 feet. I have read of some of Greaves' experiments, but I cannot at this moment give the Commission any detailed information in regard to them.

196. *Mr. Barton.*] The opinion of squatters to the effect that evaporation is considerably less in deep tanks than in shallow ones is based on the fact that the water is so much cooler in the one than in the other; I have received a number of letters bearing on the question of evaporation. It is a very troublesome point to deal with. No two tanks would be circumstanced exactly alike. Every variation of the conditions makes a difference in the amount of evaporation.

197. I had, at a place 20 miles from Bourke, a 12,000-yard tank, at which no stock were watered; the whole soakage and evaporation for six months was 2 feet 6 inches; the only water taken out

was

was taken by the paddymelons, and by men who desired to get buckets of water for their horses; the tank at the end of the summer was not 2 feet 6 inches lower: how do you account for that? I cannot account for it, but probably some rain fell during the six months. I have here a paper by Mr. F. J. Byerley, in which he refers to a statement made by Mr. Wright, which, however, I have been unable to find in Mr. Wright's papers. He says, "In a very valuable paper read before the Association of Engineers in Sydney, by Mr. J. Wright, an engineer of much practical experience in the waterless portions of South Australia and New South Wales, it was stated that, of the annual rainfall over the immense watershed drained by the Murray River, not more than a one-thousandth part escapes to the sea." I have tried for some years to get at the discharge of the Murray. It is a very different river from the Darling, and is in every way more difficult to deal with. In the Darling country there is a general slope. The rainfall is not much affected by the contour of the country; where it is so affected, the contour is so gradual that it is safe to take the average. But coming to the heads of the Murray you have to deal with a different set of circumstances. It is necessary to know how far the heavy rainfall extends. The rainfall on the lower parts of the Murray is about 15 or 20 inches, but on the upper parts it runs up to 60 or 65 inches; I do not know the area over which that extends. For a few square degrees the catchment of water was about 25 inches. Only a rough calculation of the quantity of water which goes down the river can be made until we obtain more information.

198. I thought that Mr. Gell had made observations of the rainfall on the Lower Murray from a very early period? From 1863 to 1869 Mr. Gell was at Lake Victoria, and from 1873 to 1874 he started again at Ki. Mr. Gell's letter which I have handed in to the Commission contains a lot of valuable information upon this point.

199. *President.*] Have you any information tending to show whether the flood area of the upper part of the Darling is known? I do not think it has ever been surveyed. I have some notes as to the extent of the flood area. I have been told that the river has been as much as 70 miles wide.

200. *Mr. Barton.*] Below Bourke, at Wilcannia? No; at Bourke. I never heard of a survey of this area.

201. *President.*] Do you know that at Bourke there is a large flood area? I have read of it; I have never been there, and have never heard of any survey showing the actual area.

202. Can you give the Commission any information as to the disappearance of water on the plains at any particular spots; the points, for instance, at which the water apparently gets away through some subterranean channels? I can give you no information derived from my own observation. Mr. William Abbott, however, has placed before the Royal Society some very valuable information upon this point, and in connection with this matter he told me some curious facts relating to the holes which are called gilgies. Into some of these holes the water seems to run away for days together; how it gets away no one knows. The impression at Dubbo is that the gilgies there are formed by a large crack in dry weather, and that in some cases these cracks extend down to porous strata, and the water gets away by that means. It may be that there are old river beds covered up with a layer of mud. If a crack were to take place in this mud there would be an open way to take the water down into the old river drift. It is conceivable that the water might escape in that way. I never heard of one of these places being dug out to ascertain what its suction was, nor have I heard of any measure being made to ascertain the actual quantity of water that escapes. I have heard that the water runs down these places for days at a time. I know of course that water escapes in this way, but it is impossible to say how much escapes.

203. Do you know of any large extent of country on this side of the Darling where, by sinking wells, you can obtain plenty of water? In the neighbourhood of Wilcannia, it is said, there is a large area in which water can be found at the same depths in a river drift extending over a considerable area. All the water is found at the same depth, which varies only with the contour of the surface. The water would appear to be passing away in the drift.

204. Have you heard that between the Murray and the Murrumbidgee the same thing occurs for a long distance? Yes; I know that that is so over a considerable area. The first well was formed there I believe in 1864. Abundance of water was found on the Lachlan by sinking at a comparatively shallow depth. Some persons imagine that there may be found in this portion of the country a sufficient quantity of water for irrigation. I was taken to task for saying that there was an inexhaustible supply of water in the west, but those who took me to task were thinking of irrigation. I never dreamed that irrigation was possible on the Darling. I do not now think it is possible. What I meant was that there was an inexhaustible supply for the wants of the country for squatting and other purposes of that description. There is not sufficient rainfall in the country to provide a supply which would be enough for the purposes of irrigation. Even if you could conserve every drop of water which fell, you would not have sufficient to irrigate the whole country.

205. Could not sufficient water be brought from some other district? In Egypt an average depth of 15 inches is required for 150 days, and I think that our western country would require as much as that.

206. *Mr. Franklin.*] But would not the rice crops require more irrigation? Perhaps; the country is hot—very dry.

207. *President.*] Is the water obtained from the wells fit for the purpose of irrigation when it is first brought to the surface? In a great many cases the water from the salt wells would not be used; I presume that for the purposes of irrigation the water would be injurious.

208. But even if the water be fresh, would it, when first brought to the surface, be fit for vegetation? I do not know.

209. *Mr. Franklin.*] In India, I believe, from 1½ to 2½ feet of water are required for the season? I cannot say. In Egypt, I believe, the quantity is 15 inches for one crop.

210. *President.*] Do you think that the rainfall in the higher parts of the Colony, supposing it runs underground, and could be obtained on the plains, would supply sufficient water for any considerable extent of irrigation? That of course depends upon what the extent is. I know of one engineer who thinks that the country might be irrigated to the extent of about a mile back from the river banks. Reports have been presented to the British Association for some years past as to the underground system of drainage in England. A short time ago I made some allusion to the subject. These reports show that there is an enormous supply of water to be obtained; and, as an instance, within an area of a few miles in the neighbourhood of Liverpool, 14,000,000 gallons of water per day are taken from a few wells. The reports also show that 10 inches of rain which percolate into the ground there would give a water supply of 143,000,000 gallons

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gallons per square mile per annum. In England they prefer underground water for drinking purposes—it is considered more pure. The available underground supply of England coming from 10,000 square miles would keep the Darling running 25 feet above summer level throughout the year. It seems reasonable, in the light of this experience in England, to expect that we have underground in the Darling country a much greater supply than is available in England; for if we leave out of consideration all the Darling country with less than 18 inches of rain, there is still ten times the English area with a rainfall of from 18 to 30 inches to give our supply.

211. Can you give us any information with regard to the subterraneous creek which appears in the Fish River Caves? I do not think I can. At the same time I do not believe that there is any doubt that a subterranean river has produced the caves. I think I shall be able to obtain some information with reference to the floods in the Murray. I have a friend who has been a resident at Moama for many years, who will be able to give me a great deal of information about the river heights at Moama. He has taken a great deal of interest in the question, and he tells me that the great flood of 1870 arose from a simultaneous flood in the three smaller rivers which supply the Murray. It is usual for the floods from these three rivers to come down in succession, but the enormous flood of 1870 was produced by a flood coming simultaneously from each one of these rivers. You will see from Mr. Gell's papers that this flood was a long way above all the other floods, as regards its elevation. In connection with this subject I may here mention one curious fact. A few months ago the Surveyor-General of South Australia wrote to me to ask if I could give him any information as to the reason why two lakes, situated on the top of hills near the border of Victoria, had varied in elevation at different periods of the year. It appears that the waters in these lakes go through regular variations in the course of the year, and he asked me if I connected it with the rainfall. I looked at the matter very carefully, and I cannot see that there is any connection.

212. These are supposed to be lakes in extinct volcanoes, are they not? I believe they are; they go through a regular oscillation, but it does not accord with the water running down the rivers or the rainfall. There is one fact which I desire to mention with reference to wells, and that is that in several places, notably on the Kallora run, there are wells where the supply of water varies with the state of the atmosphere. That has been noticed in a number of places in the Colony; that is to say, the differing states of the atmosphere affected the quantity of water discharged. There has been a marked instance of this effect on a station to the south of Cooma—Babandarra Run. The water there in a certain creek stops running, and when it commences to run again the circumstance is regarded as a sign of rain. The explanation of this is to be found in the variation of the barometer; when the barometer falls the pressure is removed, the air inside expands and forces the water out. When a barometric depression has passed over the country, water has been known to commence running in many places. There are wells in the Murrumbidgee in which the quantity of water varies with the state of the atmosphere. There is another instance on the Gundare run, close to Coolah.

213. Can you tell us whether there is any regularity in the seasons as regards the rainfall: I believe you have given that subject special attention, and have attempted as far as possible to ascertain whether our seasons do or do not run in cycles: in a work published by you in 1877 you give statistics of the floods, as far as the records are available? As far as the records were available. Since that work was published, however, I have obtained a quantity of additional information. The work to which you refer is practically out of print, but the publication of it brought to me a great deal of valuable information. For instance, I have obtained the whole of the observations made by the late Captain King, and I also have some valuable observations by Sir William Macarthur; these would go to amplify the details of the work.

214. What is the result of your researches with reference to the cycle of seasons? After a careful examination of all the rain statistics which I could obtain, it appeared to me that the most probable cycle was a period of nineteen years. That idea was my own as far as it affected this Colony, but an attempt was made in England many years ago to show that the period there was eighteen years. A serious difficulty, however, arises in reference to this matter, and I am endeavouring to investigate it. The only records extending back for any period affect the coast districts, and many people say that the coast climate is not the same as the climate of the interior, and that these observations on the coast are no guide with reference to the interior. As a matter of fact the droughts to which we are subject seldom or never affect the whole Colony—they affect certain districts only. The interior, for instance, has recently suffered from a drought as severe as any which has occurred in this Colony for many years past, but on the coast, near Sydney, we were not particularly hurt by it. It is difficult at present to advance any definite theory with reference to this subject. I have not altered my opinion; I still believe that the period of nineteen years is the most probable period in which the seasons return. I am quite unable to say definitely what is the area over which the historical droughts extended. It is only during the last six or seven years that I have had in operation a general system for the collection of rain statistics. The year 1882 was a fairly good one, but in all the country west of the Darling there was a frightful drought. To some extent the drought existed to the east of the Darling; last year the drought extended still further to the east, and in some cases there was 50 per cent. less rain than the average. The statement that seasons recur in a cycle of nineteen years should be made in connection with this further statement, which is, that you could not find two seasons exactly alike if you were to examine through the whole of the records; it is only the general character of the seasons which appears to recur. In the year before last I published a diagram showing the variation of the rainfall in England; for a hundred years attempts have been made there to show that there are cycles.

215. In some parts of the work to which I have referred you favour nineteen years cycles, but it would appear that there are intermediate cycles of about ten or eleven years? I pointed out that the cycle which had obtained the most adherence was that of ten years, and it is a curious thing that from 1830 upwards for some years the cycle of ten years fits in very well. Old colonists believed that the seasons did recur once in ten years, but in attempting to follow out this theory I found that the cycles did not continue at those intervals—the periods varied. Mr. Tebbutt believes that there is a period of three years; that fits in very well with his own observations extending over seventeen years, but going further back it would be found that his cycle did not apply. In Tasmania for twenty-five years they had a dry and a wet season alternately, and people there began to think that they had arrived at a very comfortable state of things as regards the seasons, because they knew exactly what to do in each successive year. At the end of this period of twenty-five years, however, a change came, and the whole theory was upset. Meteorologists do not think it possible to find a cycle in which exactly similar weather recurs, but nevertheless I think it is safe to estimate the future from the past in this subject. If you look at the records in England and in this

Colony,

Colony, it is clear that from 1840 onwards, taking the rainfall, there has been a great increase in both the northern and southern hemispheres. The last three years, however, seem to show that we have passed by that. H. C. Russell, B.A. 3 July, 1884.

216. Have you arrived at any conclusion as to the cause of the wet and dry seasons: I observe that in one paper which you have written, you attribute the variation to some extent to the presence or absence of meteors? The immediate cause seems to me to be found in the oscillation of the trade winds. When the margin of the trade winds goes further south we usually get dry weather, and there is generally an abundant fall of rain in Victoria. The ordinary margin of the trade winds is in such a latitude that we get rain all over the Colony; if it goes further north and into Queensland, they have a dry season in Victoria. This is not simply a local experience—it affects the islands in the Pacific also—they are affected in precisely the same way by the oscillation of the trade winds. The cause of the oscillation of the trade winds is another question, and a very wide one. All attempts which have so far been made to show that there is any oscillation in the temperature of the world have failed. Attempts have been made to show that when the sun has the greater number of spots there is a different temperature affecting the earth than when there are few spots; but nothing definite can be made out. When you look at the data upon which you have to rely, you are met with difficulties, because the records of the temperature are not of such a character as would enable you to determine the absolute amount of heat which the earth receives from the sun, and this is probably what regulates the trade winds. As I pointed out years ago, there are some very curious facts to be observed in connection with the appearance of comets. The return of some comets has been invariably followed by a dry season. It is a well-ascertained fact that in Europe the seasons in which some comets have been present have produced extraordinary effects; one of these seasons produced a wine which is still known as the "comet" wine, from its peculiar properties. I do not believe the comet has of itself any effect; it is only an indication that there is something in the solar system affecting the atmosphere generally. There are cases on record which show that for longer or shorter periods the sun has seemed to lose its light and heating power—once for a whole year the sun did not possess its normal power—the fruits did not ripen at all. We cannot conceive of the temperature of the sun itself altering. Probably something intervened between the sun and the earth. The most reasonable explanation seems to me to be that there were meteors.

217. Was the season a wet or a dry one? I cannot say; this happened in historical times—very many years ago. So late as 1783 the earth was covered with a sort of fog for many weeks, and it was impossible to see the sun until it had risen 20 degrees above the horizon.

218. Was that fog? It may have been meteoric dust; no one knew what it was.

219. *Mr. Donkin.*] Have you any record of the hours of sunshine? I observe that a record is regularly kept in England. There is no such record kept in this Colony. The reason why I have not kept the record is that the instrument employed to take the measurement is such an unsatisfactory one. Mr. Balfour Stewart showed me the instrument which he had been using in England. It was a glass globe—a solid piece of glass—and a piece of paper was placed behind it. The sun's rays, concentrated by the globe, burnt the paper, and the distance of the burn showed how much sunshine there had been. It seemed to me to be such a loose way of taking the measurement that I did not think it worth while to adopt it. In the first place they used a piece of wood. I was shown a number of pieces of wood which had been used for a month each. Many of these pieces were burnt more than half-an-inch deep, but how much sun heat there had been no one knew. The same with regard to the paper. If a piece of paper is burnt by fire you cannot tell how much fire it has taken to burn it.

220. *President.*] Referring once more to the loss of water, here is a section of the Darling for 100 miles, showing the indentations in the banks of the river; you think that in times of flood there is a loss of water; is it possible that the water gets away in these openings? I am afraid I cannot answer that question. I know that the water gets away, but I can give you no details showing where it escapes.

221. Can you give us any further information in reference to the borings on old river beds? I have collected a great many curious facts in reference to the supply of water in the country near Bourke. In one place an abundant supply of water can be obtained from an old river bed at 82 feet from the surface; in the same locality the artesian wells go down 400 and 500 feet. It looks as though the water in these particular wells was obtained from another source.

222. *Mr. Barton.*] In many cases I have obtained water there, but it is salt: you are aware that a great deal of the water obtained in this manner is salt? I am. I happen to know that Messrs. Mann, Carey, & Co., when constructing the railway from Nyngan to Bourke, sank three wells in which the water was salt; but fresh water was obtained at Girilambone.

223. *Mr. Donkin.*] Will you give us your opinion as to the moon's influence on the rainfall—as to whether it is in any way affected by the moon when at apogee or perigee: ninety-nine men out of a hundred would say that if the moon comes in wet we may expect a wet month: can you give us any information on the subject? The nineteen-year periods are moon periods. I could show you a number of papers written in Europe and in India, some to prove that the moon has a decided influence on the weather, others to prove that it has no influence whatever.

224. *President.*] Do these papers refer to the phases of the moon? Yes, many of them—not all. I do not think the phases of the moon have any effect upon the weather, but obviously the moon has some effect. I can show you months in succession in which certain changes in the weather have taken place at intervals of seven days, then there comes a break. For ten weeks in succession there has been rain on the same day of the week; then you have fine weather. It does not follow that the influence which produced the rain did not come on the returning day when there was fine weather. The effect which the moon produces will depend upon the state of the atmosphere at the time when the lunar change takes place.

225. *Mr. Donkin.*] Do you think that large bush fires affect the weather? I think not—at least all the cases I have examined have gone rather against that theory.

THURSDAY,

THURSDAY, 24 *JULY*, 1884.

Present:—

MR. BARTON, M.P.,	MR. GIPPS, C.E.,
MR. DONKIN, J.P.,	MR. LYNE, M.P.,
MR. FRANKLIN, C.E.,	MR. MURRAY, M.P.,

MR. TOWNSEND.

W. J. LYNE, ESQ., M.P., IN THE CHAIR.

Victor Czarlinski called in and examined:—

V. Czarlinski. 24 July, 1884.

226. *President.*] You are by profession an engineer? I am a civil engineer, graduated at the University of Ghent.

227. You have had considerable experience in connection with water conservation? Yes. In 1878 I founded a technical newspaper at Warsaw, and I was called to study different questions in connection with the conservation and supply of water. At that time a Commission was appointed to take into consideration the canalization of the Vistula. The Commission was composed of German, Austrian, and Russian engineers. In studying the question as to what means should be adopted to improve the navigation of the river, they travelled upon it for a long time, but they arrived at no decision. The German Commissioners advocated that weirs should be constructed perpendicularly with the course of the river; the Austrian Commissioners recommended that weirs should be constructed longitudinally in the river bed; the Russian Commissioners abstained from making a recommendation; and nothing was done. I occupied myself with this question in connection with my technical newspaper; and being on a short visit to Brussels, I obtained from the Department of Public Works a great deal of information in reference to the canalization of rivers. I was made acquainted with everything which had been done in Belgium in connection with the canalization of rivers. I also became acquainted with the hydrological works of M. Belgraud, who was commissioned to make inquiries with reference to a water supply for Paris. This gentleman made a hydrological survey of the basin of the Seine, and by studying this work I came to see that the basis of every scheme of water conservation must rest upon a perfect knowledge of the geological and meteorological conditions of the country. By a combination of the facts revealed by geology and meteorology one can discover what becomes of the rainfall. It seemed to me that on this basis alone could it be determined what should be done in reference to the Vistula; and I could not agree with the proposal to construct the weirs, because the ground being permeable the water could not be retained, but would escape away underneath. Many rivers of to-day are very small streams compared with what they have been in previous geological epochs. A river carrying less water contracts its bed, and the weirs would have that effect. The river being prevented from overflowing would improve itself by dredging its bed. In 1880 I was appointed a member of a Commission to inquire into the merits of a scheme for the water supply of Warsaw. Before the meeting of the Commission I made a careful examination of the surrounding country. I turned my attention to the nature of the soil. It was said that the water could not be obtained from springs, and it was proposed to take the water from the Vistula—a plan which on sanitary grounds is not approved by modern engineering science. It would of course be preferable to obtain the water from another source. I was afterwards entrusted with the construction of a railway in the Russian province of Koursk. It was necessary of course to obtain a supply of water for the stations, and here again therefore I was occupied with the question of water supply. I was also occupied with a similar question at the Congress of the Imperial Russian Technological Society at Moscow, in 1882. A desire to study the hydrological conditions of Australia was the special cause of my visit here. I knew, from what I had read of the physical conditions of the country, that they differed very much from the physical conditions of European countries. In studying the geological conditions of the country, I have not lost sight of the fact that the flow of the rainfall into the rivers is determined by the nature of the soil. On impermeable soil the water flows over the slope into the river. On permeable soil the water, instead of taking a course over the surface, sinks straight down until it reaches a lower stratum of impermeable ground; it goes thence to the natural watercourses which drain the country. This is the general rule; the exceptions are very numerous. In impermeable country in which there is no fall, the water of course cannot escape, but remains in pools until it is evaporated. Now, with reference to the quantity of rainfall which is available for practical purposes, if you take a river basin a great part of which is impermeable and level, the rainfall is not apparently of much benefit to the river. In calculating the rainfall on the whole area of the basin, a deduction must be made for the fall on that portion of the basin on which the water is physically prevented from entering the river. The water which flows into the river is that only which falls on an impermeable slope or on permeable ground in connection with the river-bed. In calculating the quantity of water therefore which should pass through a river, the area of the rainfall must be limited by the physical and geological conditions of the country. I have here a rough sketch of two old beds of the Murrumbidgee, at Narrandera. On reading the evidence given by some witnesses before the Select Committee of the Legislative Council, in reference to the Pastoral Dams Bill, I found the statement that certain creeks were not running to but from the Murrumbidgee. This led me to suppose that the country must be permeable. The features of the bottoms of all the valleys are in permeable ground, of a slightly convex shape. The water falling on the permeable soil feeds the river from underground. At the time of flood the water rises where it meets with the least hindrance; it overflows, and deposits loam and stone on the river bank; and that is how the bottom of the valley comes to have a convex shape. This map shows the river bed as it now exists. The middle line shows an old bed, and there is yet another bed. You see that the river becomes smaller and smaller. The more ancient bed you find compact gravel, and in the river-bed you will find gravel and sand mixed. The *régime* of the river has undergone a great change. Some time ago the bottom of the river valley was exactly over impermeable strata; the floods must have been very heavy, and have carried the gravel down from the hills. The river appears to have become smaller with the change of climate which appears to correspond with the epoch of an entire change of climate in Europe. As the rivers become smaller, the floods are not so violent. They may be as heavy as preceding floods, but they are not so violent in their course down the river, for the reason that the river bed has been filled up with permeable material. Again, the river is not only fed by water which runs over the slope—it is fed by water from underground, which runs with diminished speed. In this case the *régime* of the river is changed—it no longer fills up with gravel—it forms marshes. The map indicates a swamp; that swamp is due to the *régime* of the present river—the river is fed underground. I have on the same plan a section of a river in France.

France. Here you have the same causes producing similar effects. At a certain point you find a swamp; the *régime* of the river has changed, and of course with a change of *régime* you must adopt different methods for the conservation of water. Take the Yanko Creek, an outlet from the Murrumbidgee. Apparently the water runs down, but it is not so. The ground underneath is impermeable; the water running through permeable strata stops at impermeable ground. When the water rises, it rises only with the level of the water permeating the strata. If the ground were permeable the level of the underground water would not rise, the water would sink perpendicularly, or would run for a few miles over an impermeable stratum and then disappear. It is the rising of the underground water which makes the river appear to flow in the direction indicated. It would be no use to attempt to conserve this water by means of dams, because as soon as the dry season commenced and the underground level commenced to go down, the water in the dams would also sink. If the water were running on impermeable ground the case would be different,—the only cause of the diminution of water would be evaporation. Here is a section of a principal valley and of a secondary valley on permeable ground. The water goes down until it reaches an impermeable stratum. The principal river naturally drains the water, and the level will differ with the rainfall. The nearer you go to the summit of the watershed, the nearer to the surface of the ground will you find the water. As long as the water is over the river-bed of the secondary valley you will have water in it. When that level ceases to be fed by new rain, the level of the watercourse in the secondary valley will lower, and finally the watercourse will dry out. In this kind of ground you will never find springs on the sides of the valley through the reason that in permeable ground the water goes down perpendicularly. If the lower impermeable stratum cuts the principal valley at a point higher than the river-bed this will be entirely in impermeable ground, and at the separation line of the two strata will occur a number of springs forming a water-level (*niveau d'eau*), as you may observe in the valleys near the tops of the Blue Mountains. The greatest source of supply, however, will be found at the intersection of the impermeable stratum with the bottom of the secondary valley. I mention these matters to show the great difference between permeable and impermeable ground. If you have artesian strata the case is different. The present condition of the Paroo may arise from two causes: its outlet being perfectly level it may inundate the country, or it may sink into a permeable stratum. The continuation of the first impermeable stratum may be at such a depth from the permeable ground that the water would go underground direct to the sea and would feed no other rivers. There are cases in France in which rivers flowing over impermeable strata almost disappear when they reach permeable ground, and re-appear at a distance of some miles.

228. Between the two points the river is lost? Yes; the impermeable strata run nearer the surface. There is a remarkable case at Mount Jura. The mountain is composed of several parts, one of which is called the Forest de la Serre and another the Vignoble. The vine is the only agricultural growth which is to be found there. Then there is a plateau, and afterwards a higher table-land. The first table-land is rendered remarkable by an enclosed basin, that is to say, there is a depression on the plateau forming a water reservoir, the bottom of which has never been reached. The water sinks through an oolitic formation until it reaches the Oxford clay; about 20 miles further on it forms the source of a little river which is never dry. There is no apparent connection between the two sources, and it is only by a knowledge of the strata that the water can be traced. Unless the strata are known, you cannot depend upon finding water by sinking a well at a particular spot. It was only by a study of the geological formation that it became known that this particular river had its source in the basin, and that by sinking a well at a given spot a certain quantity of water could be obtained.

229. *Mr. Townsend.*] What is the difference between the level of the basin and of the outlet below? About 3,500 feet. I have made a sketch, showing that there exists a strong connection between meteorological phenomena and geological features. The lines represent the height of the rainfall; the line representing the rise in the river takes the form of a curve. If the line takes the direction indicated at this point on the plan, it means that the river rises slowly; it could be ascertained how many days after the rainfall this rise takes place, and the time which the rainfall will take to reach a certain part can also be calculated. It will be found that on permeable ground the line rises slowly. In the case of rainfall upon impermeable ground, a sharp rise in the direction of a line is indicated—it jumps suddenly upward. This is especially the case in winter, but in summer we have the same phenomena, only the height of the river is much less, because the loss by evaporation is much greater, and there are rains which make no difference whatever to the river, even on the permeable ground. On the maps indicating the rise and fall of the rivers Darling and Murrumbidgee you will observe that there is, in the shape of the curves, a great difference at Hay, and from that point you have a curve slowly rising and slowly sinking; at Bourke the curve jumps straight up.

230. *Mr. Gipps.*] Perhaps the difference is caused by difference of grades? I do not refer to the quantity of rain. The shape of the curve illustrates purely the way in which the water reaches the river, whether under permeable or over impermeable ground.

231. *President.*] It does not matter whether the water comes from snow or rain? No; in either case there is no difference. What influences the *régime* of the river is the undersoil. The water, of course, requires more time to sink down and then flow upon impermeable underground to the bottom of the river-bed than it requires to flow over a slope of impermeable ground direct into the river. This is shown by the diagram—in some cases you have a sharp curve, in other cases the curves are very gradual. It points to the fact that one river is better than the other, because in the one case you have a natural storage of water on the basin of the river.

232. *Mr. Gipps.*] The declivities of the river are totally different. The declivities of the Darling are 4 to 6 inches to the mile; the declivities of the Murray are 2 inches in 20 or 30 feet? That proves that in the one case you have to deal with a permeable ground. The water reaching Bourke from the mountains so fast as to make such a rapid rise in the river is another proof that in the one case the ground is permeable and in the other impermeable. The pressure of the water coming in suddenly and rushing over the ground makes the river rise to the height indicated.

233. *Mr. Barton.*] May it not be due to a certain extent to the tropical rain? The absolute height is, of course, dependent upon the amount of rain, but it is important to consider the way in which the river rises, that is to say, whether the curve rises suddenly or whether it rises gradually.

234. *Mr. Gipps.*] Here is a case in which the river at Murrumbidgee shows a very sudden rise, whereas the oscillation of the river at Bourke is gradual? My observations apply only to the general nature of the curves.

V. Czarlinski. curves. Wagga is, of course, in a different position; it is on impermeable ground, and that would account for the sudden jump.

24 July, 1884. 235. *Mr. Gipps.*] At Wilcannia the curve is even for some distance? It is not marked between certain parts; it then rises to a certain height, and it apparently maintains that height—you have no rise or fall of any importance; if there should be a great rain on the mountains it would jump up—the line would suddenly rise, but it would soon return to its former level.

236. *Mr. Franklin.*] Can we take it as an established rule that where we find the greatest rise of flood the ground is less permeable than at those parts where the river flows at a lower level? That is one of the signs by which you may judge of the impermeability or permeability of the ground. In the first instance you must have regard to the height of the river, and then you must pay attention to the way in which the river attains that height and goes down. If on reference to a good map you see a number of rivers, you may be pretty well sure that the ground is impermeable, whereas in permeable ground the rivers are chiefly underground. The Darling is mostly on impermeable ground; but there is an absence of slope. The rain which falls between Nyngan and the Darling stops where it falls; if it rains for a short time, the whole country is flooded for a few days. The country is practically level; if there were a little more incline you would find a number of little creeks. If you had no rain they would soon run dry. In the case of creeks on permeable ground, however, it does not necessarily follow that because the beds of the creeks are dry there is no water; it is merely an indication that the level of the water underground has been lowered. Therefore, if you are acquainted with the nature of the ground, you will know whether it is or is not possible to find water when the bed of a creek is dry. In the one case you can construct dams; in the other case you can deepen the bed by dredging, or you can sink wells.

237. *Mr. Franklin.*] We want to discover whether it is possible to intercept the water in the tributaries of the Upper Darling, to ascertain without doubt the permeable portions of the country, to there divert the water by means of canals, and to let it into the river again at a point which we know to be impermeable? Whatever plan you adopt for the conservation of water must be based upon a thorough knowledge of the geographical features of the country. I have here a rough sketch of the geological features of a portion of the country. There is near Bathurst a patch of tertiary, beginning near the tributaries of the Macquarie. Here you have a patch of tertiary situated between impermeable strata. When in such a case you have found the permeable strata, you can by studying its direction ascertain to a certain extent where water may be found.

238. *President.*] As regards the tributaries of the Upper Darling, the best way in which to discover the locality of the permeable strata, I suppose, would be to discover the rise of the river at certain points after certain rains? In my opinion, water gauges should be erected on the different tributaries of the Darling.

239. Suppose it were thought possible to conserve a large portion of the rainfall on the Darling by the construction of a reservoir, do you think we could find a sufficient area of holding ground? That is a matter which requires to be studied on the ground. If you could find a sufficient area of impermeable ground, and conveniently situated, I think the scheme would be a good one.

240. *Mr. Barton.*] We found that on all the banks of the tributaries of the Darling there has been a constant deposit of alluvial silt until the banks are raised, and the drainage is naturally at some distance from the banks of the river; we thought that it would be well, if possible, to take the water from this natural drainage ground to a holding ground lower down? There is one thing which should not be lost sight of when you are taking into consideration such a scheme as you mention, and that is that some rivers form an almost impermeable bed by the deposit of mud; if you cut through the mud you will find that the ground is quite permeable.

241. The whole of the tributaries running into the Darling have near them ground which is permeable at points 2 ft. 8 in. or 3 ft. from the bed which they have formed by the mud? On the 12th January, 1865, 4½ inches of rain fell throughout the whole of that country. It was an enormous rain—sufficient to drown horses in the paddocks. It did not make a difference of 1 inch in the water on the Darling, and that shows very plainly that the ground between Nyngan and Bourke is permeable. About three weeks after the date I have named the river was flooded. That is a startling fact, and should be taken into consideration in connection with any scheme you may adopt.

242. In referring to the rapid rise at Bourke you said that the ground there was impermeable: I do not think that is the case—it is impermeable at the head of the river? In studying the rivers you must not consider one portion alone, or you will arrive at wrong conclusions. There are cases in which the impermeable ground at a certain point on a river will cause the water to go at a great speed over permeable ground. You may think that the ground there is impermeable, but it will be found to be permeable. If you refer to a geological map of the Seine, you will see that the ground over which it flows is alternately permeable and impermeable. If a considerable area of impermeable ground is followed by a small section of permeable ground, the *régime* of the river on the permeable ground will be the same as on the impermeable ground. The cause is to be found not in the local conditions, but in conditions which are to be found higher up the river.

Mr. David Waugh called in and examined:—

Mr. D. Waugh. 243. *Mr. Franklin.*] I believe you have invented an excavating machine? Yes.

24 July, 1884. 244. Has it been in practical work in this Colony? It has only just started, and under very disadvantageous circumstances. I supplied a machine to Mr. Crombie in Queensland, but it has not yet been worked, on account of the dry weather and the want of water.

245. Has the machine done any practical work in any other Colony? One has just started work in South Australia.

246. Can you give the Commission a short description of the machine, and the nature of its working? The machine combines the two processes of the present system of excavating, ploughing, and scooping. My idea was to perform both these operations by one machine, by making the scoop strong enough to tackle solid ground, and in adopting steam-power to work it.

247. Hitherto the machines have worked when the face has been already made? We propose now to form a face with the machine, and to take out earth at depths of 6 feet 6 inches. When one depth of 6 feet 6 inches has been stripped a smaller depth may be operated upon.

248.

Mr. D. Waugh. 24 July, 1884.

248. Would it be available for tank-sinking over a large area? I think that with certain improvements the machine could be made suitable for that purpose.
249. What quantity of earth could be removed in one day? I have machines for small power, and machines for large power. I should say that a machine worked with 4 or 6 horse-power would give an excavation of 500 yards a day. The machine which I supplied to Mr. Crombie took out 60 yards in one hour at Eveleigh. The cost would be about 3d. per yard. The theoretical cost is considerably under that.
250. At what do you reckon the expenditure all round per diem, that is to say, for the wages of the men, and reckoning also for wear and tear; suppose the machine were to be taken into a distant part of the country, what staff would you require to work it? Two men and a boy would be ample to work the machine. Men's wages would be about £1 15s. I should think £1 would cover the cost of water; a load of wood would last about a couple of days; oil and sundry other expenses would amount, at the outside, to about 5s. a day. Of course I am not now including camping expenses. Putting aside expenses of that character, I should think that the total cost would be at the rate of 1½d. a yard.
251. But under the worst conditions of inland carriage what would the cost be? At the very outside, 4d.
252. Of course in large excavations there would be the disposition of the spoil to be considered? That would increase the cost.
253. *Mr. Murray.*] I suppose you would have to use drays to take it away? Yes. Mr. Crombie's estimate, including the carting of the spoil, was 5d. per yard.
254. *Mr. Franklin.*] What is the smallest cross-section of a cutting which you could make; could you work at certain levels given? It would finish completely off to any gradient. We can dig to a depth of 20 feet, and we can deliver all to the surface; and the improved machines will be able to work on almost any slope.
255. What is the smallest area of space upon which the machine can work? The machine can stand in about 8 or 10 feet, and the slope might be 1 in 1, and you would not require a steeper slope than that.
256. *Mr. Donkin.*] Would 4d. per yard include the making of the face in the first instance? Yes.
257. *Mr. Franklin.*] How do you deliver the material into the cart? It is delivered into the cart at the top of the bank from the scoop.
258. What is the cost of wear and tear? The machine is so far in its initiatory stages. I have not had sufficient experience to justify me in answering that question.
259. When the machines have been established some time I suppose you would be able to import them at a cheaper rate? I think there is very little doubt of it. The machine is yet hardly past its experimental stage.
260. *Mr. Donkin.*] You say Mr. Crombie took one of the machines? Yes; but he was only able to erect it. A drought then set in, and there was not afterwards sufficient water to fill the boiler.
261. Is not the wear and tear rather heavy when you are working heavy soil? The point of the spade is the only part which is worn.
262. *Mr. Franklin.*] Would the machine be suitable for the cutting of small distributaries? The Commission will see from the plan which I produce (*Appendix* B) that it will be suited to cutting at any depth. The cutting seen in the plan may be widened by stripping along the side. You can start upon the surface of the ground to make the cutting which is indicated by this plan, and then there is no necessity to move the machine so much.
263. What advance would be made per diem in the cutting illustrated by this plan? If the machine were about 4-horse power, the average delivery would be about 400 yards per day. That cutting would be 20 feet wide by 9 feet deep.
264. Supposing the cutting were 4 feet deep, with a slope of 1½ to 1, how much advance would be made per diem? Roughly speaking, the machine ought to advance 130 lineal yards a day.
265. *Mr. Gipps.*] What would the machine excavate in that time? About 400 yards.
266. *Mr. Donkin.*] Have you tried this machine for cutting canals? Two are in use in South Australia.
267. Could it have been used, for instance, for the cutting of the canal from the Nepean to Prospect? Only in some parts.
268. *President.*] What would be the average cost per diem? About £3 a day. The actual expenses in working the machine and the fuel would not amount to more than £2.
269. The canal described by Mr. Franklin would cost then about a shilling a lineal yard? About 6d., I think.
270. *Mr. Franklin.*] In some cases it would be necessary to carry the spoil forward to form banks in the formation of the distributaries—I suppose in that case you would have to cart the spoil? I think the better plan would be to dig deeper down at the necessary places.
271. *Mr. Donkin.*] You say that you have completely overcome the difficulty which has hitherto existed in regard to the cutting of the face? Yes; I have a small machine for cutting drains about 3 feet deep by 12 feet wide. It will be completed in about a week, and I will have it in operation at Waterloo, at the tannery of Messrs. Geddes Brothers.
272. *Mr. Franklin.*] That machine will be specially suited to the cutting of small drains? Yes, on sloping ground. The stone which I now produce was cut through by one of the machines working at Liverpool; I produce it in order that the Commission may form some idea of the capabilities of the machine when working in ground in which stones are plentiful. Stones will not interfere with the action of the machine.
273. *Mr. Barton.*] Did not that stone disturb the cutting? The spade was slightly affected, but it did not affect the machine.
274. *Mr. Franklin.*] Has there been no experience of the practical working of the machines in South Australia? The machines were taken there in wet weather, and under the most disadvantageous circumstances; they delivered 60 yards an hour; they are in use in a very rainy district, and as they are digging vertically it has been decided to stop the work until the dry weather comes on.

THURSDAY, 31 *JULY*, 1884.

Present:—

MR. BARTON, M.P.,	MR. GIPPS, C.E.,
MR. DONKIN, J.P.,	MR. MURRAY, M.P.,
MR. FRANKLIN, C.E.,	MR. TOWNSEND.

R. L. MURRAY, ESQ., M.P., IN THE CHAIR.

Mr. Victor Czarlinski called in and further examined :—

Mr. V. Czarlinski. 31 July, 1884.

275. *Chairman.*] Can you give us any further information with respect to the subject of your examination at the last meeting of the Commission? I have brought with me a hydrological map of the basin of the Seine, in connection with which there are diagrams showing the rainfall in the basin. The watershed of the Seine is divided into the basins of the different tributaries of the river. The diagram which I have now before me shows the rainfall by daily records in the basin of the Seine proper. It will be observed that the level of each of the meteorological stations is given. The diagrams also contain the average rainfall at each of the stations, together with the average rainfall of the whole basin of the main river.

Hydrological map of the basin of the Seine, and diagram of rainfall.

276. *Mr. Donkin.*] What is the average? The average rainfall in the basin of the Seine proper is 26 inches, but the discharge of the river is only 12 per cent. of that rainfall.

Rule in regard to rainfall.

277. What is the rainfall at the heads of the river? It would be about 27 inches—a difference of about an inch. As a general rule, the further away from the sea the rainfall decreases, but the higher you go the greater is the rainfall. This is also true in the case of the tributaries of the Seine.

Influence of rain on rivers.

278. What is the general height of the heads of the river above the sea? About 2,000 feet. You will observe that some of the rainfalls have no influence whatever upon the rivers. This is particularly the case with reference to summer rains—the June and July rains. The rivers not only do not increase, but the level goes down.

Point of saturation of soil.

279. How do you account for that? The soil is not only permeable, but it is dried by the heat of the summer. You require a great quantity of rain before the river can rise. The soil has to be filled to a point of saturation. It is very necessary, therefore, in connection with this matter, to ascertain the description of soil with which you have to deal upon the banks of the rivers.

Hydrometrical service.

A permanent hydrometrical service has been established in the basin of the Seine, and maps are printed every year. These are sent to the engineers of the Public Works Department, to the district engineers, and so on.

280. *Mr. Gipps.*] Do the diagrams which you are now exhibiting show the average mean depth at any particular locality? They represent the height of the river at one locality. There are several stations in the basin of

River gauge.

each of the tributaries, and the different diagrams show the height at each point. The river gauge is fixed a little higher up than the junction of the two rivers. This is done in order that the height in the tributary

Maps showing quality of water.

may be ascertained independently of the influence of the state of the principal river. Maps are also published showing the different qualities of the water throughout the year. The black groundwork shows that the water is impure, and as the groundwork becomes lighter and lighter the increase in purity of the water is indicated. If the water comes from an underground source it will be much more pure than that which flows from an impermeable slope, for the simple reason that the water which flows over the slope will carry with it loam, leaves, and all kinds of rubbish, whereas the permeable ground is a kind of natural

Geological map.

filter. I have here a geological map showing the different formations to be found in the basin of the river. It will be observed that they take the form of a fan. You have the old formations at the top, and they gradually descend to the sea-level, where you find the newest formations. The colouring of the map shows the permeability and impermeability of the soil. The light colours indicate permeability, and the dark tints indicate impermeability.

Division of the province of Champagne.

281. *Mr. Donkin.*] Judging from that then, the river is only impermeable at the source? No, there are other parts in which impermeable ground is to be found. Here, for instance, is the province of Champagne. It is specially divided by its geological and hydrological features into two parts. One is known as the dry Champagne country, and the other is known as the wet Champagne country. In one part you have on the surface a number of little rivers and creeks. The soil is very wet throughout the year. When you come to the higher cretaceous soil the water disappears. It is the most sterile portion of the whole French soil. The impermeable stratum runs very deep underneath it. Here is a similar map showing the number of creeks and rivers, from which you may judge of the permeability or impermeability of the soil. You may observe from this map the effect of the oolitic and the cretaceous formations upon the existence of rivers. The exterior features of the country show very clearly the distinctions between the character of the soil. As I have already said, the dry portion of the Champagne country is perfectly sterile.

Underground water in soils of different nature.

282. What is the Burgundy country like? That is only a part of it. It is only an oolitic formation, and that of course is not so permeable as sand or chalk. There is a great distinction between the permeability of the two descriptions of soil. In sand the underground water level is continuous. In the oolitic formation you may have plenty of water, but it will exist only in separate underground streams. You may sink for a well at a particular spot and find no water, whereas a few yards further you will find plenty. The water runs in the crevices. In connection with the geological features of the basin of the Seine you will observe green sand. You cannot very well see it from the map. That sand obtains its supply from the oolitic formation which adjoins it.

283. *Mr. Townsend.*] Can you give us any idea of the width of the outcrop of the green sand formation? I have no papers here which will permit me to do that.

284. You are not aware of the extent from your own knowledge? No, I cannot say exactly. There can be no doubt that the green sand is fed by water coming from the other permeable strata. This is plain

Artesian well at Grenelle.

from a diagram in the hydrological work of M. Belgrand, in reference to the water in the artesian well at Grenelle. The diagram illustrates the levels of two rivers, and it shows that in one part the water being at nearly the same level comes from the permeable ground to the green sand.

285. What is the width of the whole outcrop of permeable strata from which the water is obtained? This map is on the scale of 16 kilomètres (about 10 miles) to the inch. You can form some idea from that of the extent of the permeable country; I should think it was about 40 miles across. The whole of that area feeds the green sand.

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286. You referred the other day to a cretaceous formation north of the Darling—I do not know whether you intended to refer to chalk; I have no knowledge of a particle of chalk in this country: does not a cretaceous formation convey to your mind the idea of chalk? Not necessarily: there may be lime and sand.

Cretaceous formation.

287. I read in this morning's paper a description of a cretaceous formation, in which there is sandstone alternating with shale: would you consider that a cretaceous formation? That depends upon the nature of the shale.

288. There is no lime? That may be brought underground. It is not stated on the geological map what kind of cretaceous formation is to be found to the north of the Darling, that is to say, whether it is the older formation or whether it is the newer formation.

Permeability of cretaceous formation.

289. *Mr. Donkin.*] Are you aware that on the Queensland maps this country is marked sandstone? I observe that that is so upon some of the maps of the Rev. Tenison-Woods. It is important to know of what kind of cretaceous formation the country is composed. Some parts of this formation are quite impermeable; other parts are perfectly permeable.

Different degree of permeability of tertiary soils.

290. But the formation may be permeable and still not be cretaceous? Quite so. The map of the basin of the Seine shows in the tertiary formation the eocene and the miocene series. In these formations you have two half permeable soils, five perfectly permeable soils, and four absolutely impermeable soils. I think the rain and river maps which I have produced might be improved by including an additional column showing the speed of the water, at certain points of which the river section should also be given. If that were done, you would be able to calculate the daily discharge.

291. Have you been out to the Bogan? I have been only as far as Nyngan.

292. *Mr. Barton.*] Have you seen any part of the Darling? No.

293. *Mr. Townsend.*] Was the geological section which you produced at the last meeting of the Commission an imaginary one? It was merely a rough sketch which I made to illustrate the formation.

M. Belgrand's hydrological survey.

294. *Mr. Donkin.*] Referring again to the hydrological map of the basin of the Seine which you have produced,—how far back do the records extend? M. Belgrand's survey was the first survey of the kind which was made. The river records commence in 1854. The results of M. Belgrand's hydrological survey were published in 1873.

Similar surveys in France.

295. Have similar surveys been made of other rivers? The French Government recognized the importance of the information contained in M. Belgrand's report, and the report was made to facilitate a supply of water for Paris. It was thought that it would be of great value as a basis for other descriptions of hydraulic works. Other engineers were commissioned to make similar surveys of the Department of Jura and of the High Alps. These surveys also have been published.

Staff employed.

296. *Mr. Townsend.*] Have you any idea of the staff employed in the preparation of the maps? A number of persons were employed. The Government commissioned an engineer to make the survey, and they gave him the authority to obtain information from any Department in the Service. He was commissioned to make a report upon the information which he obtained in this manner.

297. *Mr. Donkin.*] Did you in the first instance come to the Colony with a view to obtain information? I was attracted by the special features of the country. The physical features of its soil and the condition of its rainfall are quite different from those to be found in other countries. I came here about eighteen months ago, for the purpose of study. I went in the first instance to Mr. Russell, to obtain from him the rain records. I intended in the interests of science to form diagrams from these records and from the results of my own observation.

Hydrological survey in Belgium.

298. Have there been no hydrological surveys in any country with the exception of France? Yes; they have been made in Belgium. In all cases the surveys are chiefly based on the permeability or impermeability of the ground. M. Belgrand's work practically started a new department in the science of hydrology. In the work to which I have referred he describes it as an application of geology to the arts of engineering and agriculture.

299. That was the first work which treated of the permeability and impermeability of soils? Yes, it was the first work which co-ordinated the facts of meteorology and geology.

300. *Mr. Franklin.*] M. Belgrand appears to have condensed into a report upon one river, the kind of information which we wish to obtain with reference to the whole of the rivers of this Colony? I do not think you could do better than follow the plan adopted by M. Belgrand, taking also the plans adopted in the hydrological surveys at Mount Jura and the High Alps.

The rainfall passing down the Seine.

301. *Mr. Donkin.*] You said that the rainfall on the banks of the Seine was about 26 inches, and that only about 12 per cent. of that rainfall passed down the river: how do you account for the difference—have you allowed any percentage for soakage? Yes; the soakage varies in different seasons and in different places. In the Mediterranean country, which somewhat resembles that of Australia, the soakage is greater than in the north of France. An experiment made in summer, in connection with 104 millimètres of water, showed that 103 millimètres had evaporated, and that there was only one millimètre of soakage.

302. *Mr. Donkin.*] Was that shown by the percolation of water? They employed a gauge, the evaporomètre, Piche.

Evaporation.

303. What is the evaporation in the summer months on the banks of the Seine? It differs very much between various points. In some places the evaporation is greater even than the rainfall. In one place there was a rainfall of 45 inches, and an evaporation of 4½ feet.

Evaporomètre Piche.

304. *Mr. Franklin.*] Have they an established rule upon the river for ascertaining the evaporation? The evaporomètre, Piche, is used. It is a very small instrument, and also very simple in construction. It is a small glass pipe.

305. *Mr. Townsend.*] Is it perfectly reliable? It is the best instrument which they have been able to obtain, and of which hydrologists have any knowledge.

306. *Mr. Franklin.*] It has been suggested that in the outlying portions of this country some practical test should be applied, such for instance as inserting shallow tanks on the surface of the ground, from which the natural evaporation could be taken: what is your opinion? The application of the evaporomètre has been thought equally practicable and more reliable. The instrument consists of a glass pipe about 1 foot in length, the diameter being about the third of an inch. One end of the pipe is closed, the other end is open and is fitted with a small spring. The pipe is graduated to show the 300th part of an inch. You turn it up, fill it with water, and cover it with a small piece of specially prepared blotting paper; this is put over the end of the tube and it is closed with the spring. You prick the blotting paper in the centre with a needle.

Mr. V. Czarlinski. 31 July, 1884.

needle. When the blotting paper has soaked full of water you mark the height of the level in the pipe, and by subsequent observations, say three times a day, you will ascertain the evaporation which has taken place.
307. *Mr. Donkin.*] How do you prevent the discharge from the pipe to the blotting paper becoming excessive? There can be no discharge; there is only evaporation. This instrument is supplied to all the meteorological stations throughout France. It is used in connection with the thermometer. You can make experiments in different places and in different conditions.
308. But it is a fact that no water can come out of the tube except that which is evaporated? That is so.
309. *Chairman.*] Where can these instruments be obtained? You may obtain them in Paris or also in London. They are very cheap; I do not know the exact cost. If you were to have these instruments at all your meteorological stations, you would in two years' time have a perfect knowledge of the amount of evaporation which takes place in every part of the Colony, excepting of course the evaporation which takes place from plants. The instrument has been known for about ten years. I may be permitted to mention here another experiment which has occurred to me, and which I think would enable you to follow up underground currents of water. I do not know that it has yet been tried. I think you might employ the telephone with very useful results. It is an undoubted fact that the rushing of water makes a certain noise. Mr. Russell told me that at a certain place in New South Wales you can, by putting your ear to the ground, actually hear the water rushing underneath. The water, however, may be at some depth at which you cannot hear it, but by the application of the telephone and the microphone the sound might be brought sufficiently close to enable you to detect an underground stream.

Use of the telephone for following up subterranean currents.

310. We may gather from what you have said then that it will be necessary for the Commission to have made a thorough geological survey of the country, to have meteorological stations fixed in every part of the Colony, and water-gauges at sections of the rivers, showing the quantity of water going down, and for the measurement of the velocity, also that we should employ instruments for measuring evaporation at these stations: I suppose it would be necessary that this system should be continued? Certainly. My opinion is that if you intend to have made an efficient hydrological survey you must appoint some one specially to do that work. You not only require the information which you can obtain from the different Departments, but it is absolutely necessary that the person commissioned to make the hydrological survey should go through the country and make a personal observation.

Personal observations.

311. *Mr. Gipps.*] We should have to employ a scientist, and the work you have mentioned would occupy him some years—is not that so? I am not of that opinion. I think you could have prepared in about two years the description of report which you would require. The person commissioned to make the report could make a certain amount of personal observation, and he could edit a great deal of valuable information obtained from the different Departments. This report having been presented, it would be necessary to maintain hydrological surveys. Progress reports would be presented, and by and by you would be in a position to complete a map.
312. *Chairman.*] How long do you contemplate remaining in the Colony? I cannot say.
313. *Mr. Donkin.*] Were you in any way connected with the hydrological survey of the Seine? No; I obtained my diploma in 1872, a year before M. Belgrand's work was published. I have been connected with hydrological works in Belgium.

THURSDAY, 7 AUGUST, 1884.

Present:—

MR. DONKIN, J.P.,
MR. FRANKLIN, C.E.,
MR. GIPPS, C.E.,
MR. LYNE, M.P.,
MR. MURRAY, M.P.,
MR. M'MORDIE, C.E.
MR. TOWNSEND.

W. J. LYNE, ESQ., M.P., IN THE CHAIR.

Mr. George Gordon, C.E., examined:—

Mr. G. Gordon, C.E. 7 Aug., 1884.

314. *President.*] You are a civil engineer? Yes.
315. You have had considerable experience in India prior to coming to these Colonies? Yes, eleven years.
316. Will you be kind enough to state the nature of your experience? I was engaged on irrigation works, which were nearly finished when I left—the Madras Irrigation and Canal Company's works.
317. Were you engaged for any length of time? Between ten and eleven years.

Experience in water-works and irrigation.

318. Were you engaged on any other works in India except those at Madras? No, not in India.
319. Where were you engaged before that? On the Amsterdam water-works, and I was connected with some drainage works in Holland.
320. Have you been engaged on other works of a like nature elsewhere? In Victoria, on irrigation works and water-works. I was Chief Engineer of Water Supply in that Colony from 1872 to 1878.
321. How many years is it since you came to Victoria? I came in 1872.
322. And ever since you have been in Victoria you have been engaged on water-works? Yes, up to 1878. After Black Wednesday I was not engaged on any special work by the Government, but I was engaged on other water-works in Victoria.
323. You were engaged on waterworks, but not for the Government? Not for the Government, until 1880.
324. Did you prepare any schemes for water supply during that time when you were engaged under the Government of Victoria? I carried on the Coliban water-works; I finished the Geelong works. A good many country towns were supplied with water, and I had the supervision of the works carried on by the local bodies.
325. Did you prepare the plans for the schemes being carried out for the local bodies in Victoria? For most of them, generally in conjunction with a local engineer, but not in all cases. Some of them were prepared independently of me; I merely superintended them.
326. Did you prepare any scheme for diverting some of the water from the Goulburn River in Victoria? Yes, two schemes—one for supplying water for domestic purposes and for stock, and the other for irrigation. These were prepared in conjunction with Mr. Black, and the first is being carried out.
327. Where are these works being carried out by local bodies? The Goulburn River scheme is one, and several others were recommended in our reports. There were nine reports.

328.

328. Can you tell us the system under which the Victorian Government have these schemes carried out? The first step was to appoint Mr. Black and myself to report on the feasibility of diverting the water of the rivers Goulburn, Campaspe, the Loddon, the Avoca, the Wimmera, and the Murray. Then Parliament passed an Act enabling the Government to form Water Trusts, and several Trusts were formed for the purpose of carrying out the schemes we proposed. Mr. G. Gordon, C.E. 7 Aug., 1884. Water Trusts.

329. Who prepared the Murray scheme? I did, with Mr. Black. That is what is called the Gunbower scheme. These Trusts generally applied for a loan to carry out our schemes, but they made considerable additions in order to complete them and to distribute the water more closely than was intended. We had intended to give a supply of water so that no part of the country should be more than 3 miles distant from a tank or watercourse. Gunbower scheme.

330. That was in the north-eastern district? North of the Dividing Range, on the northern plains.

331. And how far west did it extend? To the Wimmera. There was one scheme west of the Wimmera, but it was only proposed to supply water there by collecting the surface water and sinking wells.

332. Not from any river? No. The Wimmera cannot be diverted westerly, and the small tributaries are not permanent enough to be made use of.

333. Is there any other provision in Victoria to carry out the works except in the way you describe, namely, by Trusts, and by amalgamating local bodies? Some of these Trusts were formed by making the Shire Councillors members of them. Where the Trusts are comprised in one Shire the Shire Councillors become members of the Trust. That is the case in the Swan Hill Shire, the St. Arnaud Shire, the Stawell Shire, and the Lowan Shire, which last is the one west of the Wimmera, where there are only wells and tanks. Shire Councillors as members of Trust.

I produce a map (*Appendix D 1*). The water of the Wimmera is diverted by means of a weir, first at Glenorchy, into Swede's Creek, leading to the Richardson. There is a cutting above the weir to Swede's Creek. Diversion of the Wimmera to Swede's Creek and the Richardson.

334. About what distance? About a mile, I think, is the length of the cutting.

335. Is that carried on in Swede's Creek? Yes, in a natural channel, improved in places. The creek sometimes spreads out.

336. Is there any canal besides this cutting? Not for the Richardson. Where Swede's Creek disappears as a creek a shallow cutting is made which leads down into the Richardson, in which it is continued, extending as far as Buloke. Instead of letting it spread over the area of the lake, it is confined in a small portion of it by a little cutting and a dam at the south end of the lake. In 1870 the lake was 6 miles in length by 3 in breadth. In 1852 it covered an area of 10 miles by 6. It was generally dry, except in years like 1870.

337. Now what is the state of the lake? There is a good supply of water in the part cut off.

338. What becomes of this water then—has it an outlet? No, the lake has no outlet. No more water need be admitted after the river is filled to this point, and if a flood came down it would pass into the body of the lake.

339. Then the water brought from the Wimmera is simply brought in such quantities as to supply Swede's Creek and the Richardson river down to the lake? Yes.

340. What becomes of the surplus water? It is not admitted, but if it were allowed to enter it would go into the lake.

341. Along the Richardson River there are dams at different places? Yes, and some more are proposed to be constructed.

342. *Mr. Gipps.*] What kind of dams? Timber weirs.

343. Fixed weirs? Some are fixed and some are not fixed altogether, because if a part were not made movable they could not be opened sufficiently in cases of flood. Weirs.

344. You always keep the channel clear by them? Yes.

345. *President.*] Where these weirs are placed across the rivers, are there off-takes to distribute the surface water over the country? In some instances there are. There is to be one at Baneyna to run the water into a lake in Avon Plain. Off-takes.

346. There are no others on that river? No, I do not think that any are proposed, but several dams are proposed to be erected on the river.

347. What size is this off-take? I do not know; it is not surveyed. I do not think it would be more than 5 feet deep there.

348. Would it be an open cutting, or masonry with regulators? There will be a timber sluice at the upper end.

349. *Mr. Gipps.*] Would it be a covered timber sluice or open? The design is not made yet, but probably there will be a bridge with a sluice under it.

350. *President.*] What size are the cuttings down Swede's Creek and the Richardson River for carrying the water off? The cutting from the Wimmera to Swede's Creek has a bottom of about 12 feet in width. Size of cuttings.

351. What is the minimum fall? One foot in a mile, and it has a uniform fall for the mile. The fall in the creek varies. Incline.

352. Do you know what is the sectional area? The greatest depth of cutting is 11 feet; but I am speaking from memory. Sectional area.

353. And what discharge of water is there? The sluices are opened just as they need water or not, and it will depend on the depth of water going over the weir at Glenorchy. When the water is level with the crest at Glenorchy it begins to flow down this cutting, and they can raise the crest of the Glenorchy weir, which increases the water in the cutting. It is therefore constantly varying. Discharge.

354. Do you know the maximum discharge? It is not intended to send down more than 3 feet in depth. Maximum discharge.

355. *Mr. Gipps.*] What will be the sectional area at a depth of 3 feet? About 60 square feet of water.

356. *President.*] Is the water taken off immediately above the dam at Glenorchy? It is about 100 or 150 yards above it.

357. Is there much deposit of silt about the outlet? Very little as yet. The Wimmera brings down a great deal of soil, but there is no appreciable deposit in the mouth of the cutting. Deposit of silt.

358. There is no irrigation going on? No, none contemplated. In the Wimmera scheme the water is not sufficiently regular or sufficient in quantity to do much in the way of irrigation. The floods are very heavy, but irregular; they come down suddenly and last but a short time; they occur sometimes in April and May, and sometimes not till August. Floods of the Wimmera.

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359. What other schemes have you planned? The next diversion is the Dunmunkle Creek. That was also a natural overflow, but only in times of the greatest flood.

360. From the Wimmera? Yes, from the same place. Years ago the squatters cut a small channel about a quarter of a mile from the river, in order that the floods may enter the creek at an earlier stage. That channel has now been slightly enlarged, and is taken off immediately above the Glenorchy weir.

Dunmunkle Creek.

361. How is it regulated? By a sluice, in the same manner as the other.

362. Is the fall broken at all? Yes, at one or two places. There are drops put in where the natural fall was too great. They have falls of about 1 foot 8 inches. They are all timber, because there is no stone about there.

363. Is any of the water at Dunmunkle Creek diverted at the falls? No, the falls are in the first part of it.

364. About what distance down from the weir? Water is diverted to the east about 15 miles down.

Length of Richardson Creek.

365. What is the length of the Richardson Creek? Between 50 and 60 miles.

Length of Dunmunkle Creek eastwards.

366. At 15 miles below Glenorchy where water is taken off, the Dunmunkle Creek on the east side extends what distance down? About 40 miles.

Natural channel.

367. By means of a canal? Yes, partly a natural channel and partly cuttings.

Width.

368. Of what size? About 4 feet bottom width.

Depth.

369. I suppose it varies in depth? Yes, but I think it is not more than 6 feet deep at any time. No volume is fixed, because they must take what they can get.

Slope.

370. What slope is this? It is 1½ to 1.

Nature of country.

371. What sort of country is it in? It is a sort of light yellowish clay in most places, and in others it is black soil.

Puddling of banks.

372. Is there any provision made in the banks where there is black soil by puddling to retain the water? No, the water is nearly always under the surface; in other places there is a little soakage, but not sufficient to necessitate puddling.

Distribution of water from creek.

373. Where is the water carried to, and where does it go to from the canal? It is taken up by dams across the creek, and diverted to the tanks alongside the creek, and the lower portion which is not yet finished will probably finish in a tank.

374. *Mr. Townsend.*] It is pretty well taken up before getting to the end? Yes, the cuttings are only where it is not defined; but one cutting was made in order to keep higher ground where the channel came too much to the east.

Duration of supply.

375. *President.*] In these channels is there sometimes a sudden supply, and is the channel sometimes dry? It becomes dry every year, probably from November until May. We can hardly hope for more than six months' supply.

376. Do you find that, after a drought and when the water begins to run again, there is a loss of supply? No, there is no great loss of water; I have not measured it to ascertain how much—there has not been time to do that yet.

Off-take called Minyip branch.

377. Are there any other off-takes? There is one on the west side, about 4 miles down the creek, called the Minyip branch.

378. It is diverted by means of a regulating sluice on both channels? Yes.

379. How far does this extend? At present it extends about 30 miles.

380. That, I suppose, is along the old watercourse? Yes, the old watercourse has disappeared in many places; in most years it is difficult to trace it—on ploughed ground you cannot see it at all; it is only in places that are not cultivated that you can trace where it is by a little water, or by the grass being a little greener.

Water in main branch of Dunmunkle Creek.

381. The water in the main branch of the Dunmunkle Creek is carried in the same way? Yes, but the channel is better defined than in the branch creek.

382. How far does that extend? Down to a place called Watcher, about 40 miles.

Athens Channel

383. What other scheme to the west is there? The next is called the Athens Channel.

384. Is that from the Wimmera? Yes.

385. From a weir lower down? Yes, about 15 miles lower down.

386. That is taken from the right bank of the Wimmera? Yes, following the old natural channel down to Murtoa, about 18 miles. Another branch of the same channel is taken off about 4 miles above Murtoa.

387. By means of a dam? No, by bifurcation of the channel. These works are more or less in progress. The Glenorchy weir was built about four years ago, before the Trust was formed by the Shire of Dunmunkle, and was taken over by the Trust. The west branch runs north about 20 miles.

Position of canals.

388. Are the canals made parallel with the watercourses, and at various distances from each other? Yes; the object being to divide the country into nearly equal sections each watered by a creek or channel.

Slope of country.

389. Is the country of a favourable nature for carrying out the scheme? Yes.

390. What is the slope? The slope of the country is 4 feet in a mile to about 2 feet or nearly. The greatest fall is at the beginning of these creeks.

Yarranbereik Creek works.

391. What is the next work? The Yarranbereik Creek works.

392. That is still westerly? Yes, it is a natural outflow from the Wimmera.

393. And follows an old channel? Yes, which is only filled in flood-time; it runs for 60 or 70 miles, and ends in Lake Coorong.

394. How is it diverted from the Wimmera? By a small weir called Yarranbiack weir.

395. How is that weir constructed? Of timber.

396. Like the others? Yes, but it is smaller, being only about 4 feet in height.

397. What is to be the cost of that weir? I do not know; I can give you the cost of the others. This was constructed many years back by the Horsham Shire Council.

398. Are these weirs provided with under-sluices in a line with the off-take? No.

Cost of weirs.

399. Can you give the cost of any of these weirs? There is a list of some of them. (*Appendix D 2.*) The cost of the one mentioned as Dooen Weir was £3,300. I have taken the sectional area of the river at the site of the weir as a measure of the cost, giving it in terms of that area, *i.e.*, cost per square foot. Taking a rough estimate, and taking into account the height and length of the wings, it comes to from £1 10s. to £4 10s. per square foot of sectional area of the river. What is under the bottom I have not taken into account in the measurement; that varies so much that I cannot say what it is.

400. *Mr. Townsend.*] And how much is a cubic foot of timber? About 4d.

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401. *Mr. Gipps.*] What would be the cost of the weirs per running foot? I have not reckoned out the cost per lineal foot, because they are so different in height? The site of the Glenorchy weir was chosen where the banks were high, so that there should be no chance of extreme flood going over the banks and turning the wings.

402. Are the abutments as high as the top of the banks? Yes.

403. *President.*] The Yarranbereik channel is small as compared with the others? Yes, it is smaller than Swede's Creek channel, but it is larger than that of the Dunmunkle Creek, though not so large as the channel of the Richardson River.

404. What off-takes are there? There are weirs at intervals of every few miles, having sluices in them, for the purpose of sending the water down to the people below before it is impounded.

Objections against weirs.

405. Have any objections been raised by the people occupying the lower ground? The people of Horsham objected to the Glenorchy weir, but it was under a misapprehension, and the objection was withdrawn when it was found that the sill of the off-take would be level with the sill of the weir.

406. Do these off-takes take off only flood-water? Only flood-water; but the Yarranbereik weir can be raised a foot higher than the sill of the sluice. There will be a notch left in the movable part, so that no complaints can be made by the people down below.

Dooen weir

407. What further works are there? The next is Dooen weir.

408. That is the one described by you as costing £3,300? Yes. There is a channel through the swamp for about three-quarters of a mile in length. A steam-engine lifts the water about 50 feet. The reason for raising the water was that it was not possible to distribute it by gravitation.

409. What is the cost of everything connected with it? I am not prepared to say from memory, but will supply it. (*Appendix D 3.*)

Pump.

410. What description of pump have you? A three-throw pump.

411. What quantity of water is it capable of discharging? Six hundred gallons a minute.

412. What is the horse-power? A nominal 40-horse power.

413. *Mr. Gipps.*] Who is the maker of the pumps? They were made at Ballarat, by a man who makes mining pumps.

Circular reservoir.

414. *President.*] The work is in a state of progress? The pumps are finished, but the work on the channel is only in progress. It is a circular reservoir of 50 or 60 feet in diameter, and partly excavated and partly raised above the level of the ground.

Supply of Horsham.

415. What is the next off-take? It is for the supply of the town of Horsham, and is erected at the cost of the Shire.

416. Is there any further distribution down the river? No, not yet.

417. In carrying out this work, do you find the supply of water below the weirs and off-takes is affected much? It is affected in a low state of the river, but not at times of flood—the river then flows over the weir.

Conservation of flood-waters.

418. You have no works to conserve the flood-water? None except the weirs.

419. There are no reservoirs in this scheme? No; when we conserve water, it is distributed in excavated tanks of about 1,500 to 3,000 cubic yards each.

Source of the Wimmera.

420. Where is the source of the Wimmera? On the north slope of the Dividing Range—the Pyrenees and Mount Cole. (*Appendix D 4.*)

421. Was it ever contemplated to intercept the water higher up above Glenorchy? Yes, but the country has not been properly examined yet. The only available places are of course alongside the river, where the land is very valuable, and there is likely to be a good deal of opposition to its being taken for the purpose of works of this kind.

Area of floods.

422. Does the water spread to any great extent above Glenorchy in time of floods? No; it is confined in the channel. It flows out a little to the south side, but at the Glenorchy weir it does not overflow the banks.

423. Have you been in the country above the upper tributaries of the Darling? No.

Area of country.

424. What area does this country which you have been referring to cover? About 2,750 square miles; that is from the off-takes downwards.

425. *Mr. Franklin.*] What is the area above the dam? I have it as far as the Yarranbereik, not to Glenorchy; it is 790 square miles,—that is above the large off-takes. Below that point there are 550 square miles, which is called the Western Wimmera. We do not include it at present as necessary for the supply of the channels described, but it is supposed to remain for the scheme which will embrace the lower part of the river.

Private property

426. *President.*] How do you manage when going through private property, as to taking up the land? There is a compensation clause in the Public Works statute which is incorporated in the Water Conservation Act. There is always an attempt to settle matters in a friendly way; if that is not successful, then there is a resort to arbitration.

Payment of water rate.

427. Do the persons benefited by the supply of water pay a rate? It is intended that they shall do so, but there is opposition to the payment at present. The payments are not supposed to begin until the people are thoroughly supplied; that is, the interest on the money expended on the works shall not be demanded until then.

428. Then the Government are at present supplying the water and bearing the cost? They supply the water and get no interest on the outlay during construction.

Formation of Trusts.

429. Are the local Trusts governed by any central body? No; before a Trust is formed an application is sent in to the Government, and the Trust is really formed by the Governor-in-Council, after an examination of the country and an estimate of the probable cost of the scheme. Then the amount of the required loan is fixed, but it can be increased from time to time if the Government choose to sanction it.

Loan.

Cost of water supply per acre.

430. Can you give an idea of the cost per acre over the whole area supplied with water by this scheme? It has cost about £116,000, and it is not considered complete. The area covered is about 2,750 square miles.

Rainfall.

Wimmera floods.

431. *Mr. Gipps.*] Have you ever calculated the amount of rainfall that comes down the river? No, I have no actual measurements of the Wimmera floods; I had to assume it in reference to a good deal of the Wimmera, but I have ascertained it in reference to other rivers. It varies a good deal. You will find the subject dealt with in one of the papers to be sent to you in connection with the north-western canal scheme, and also in the Board's Report on the Wimmera scheme. (*Appendix D 5.*) I made use of all the particulars I had five or six years ago in making the calculation. Previously to that I had made careful observations near Sandhurst, and found the available supply was one-sixth of the rainfall.

Available supply of the rainfall.

Mr. G. Gordon, C.E. 7 Aug., 1884.

432. *President.*] Have you any idea of the cost per acre over the area the works supply with water, or have you worked it out? It is about 1s. 4d. per acre.

433. Were you troubled much by the nature of the soil in the places where the works were constructed? No, not in the district I have spoken of. In the Richardson and Avon the water is salt in the summer.

Salt incrustation in lakes.

434. *Mr. Townsend.*] Have you never seen the salt incrustation in the lakes the Wimmera crosses? Yes, but I do not think it is so visible there as at Swan Hill. The flood-waters are perfectly fresh. The Wimmera is pretty brackish at the mouth in summer.

Evaporation.

435. *President.*] Do you find the water affected much by evaporation? It is not much noticed in the channels, but there has been so little time to make observations. We have made observations on evaporation over a good number of years. It was about 42 inches in the year from the surface of water. That was at Malmesbury, which is an exposed bleak part of the country.

The Gunbower scheme.

436. Are you preparing any scheme in connection with the Murray River? Yes, that is being carried out; it is called the Gunbower scheme in the Board's Reports, and is being carried out by the Swan Hill Water Trust.

Supply for pastoral holdings.

437. *Mr. Franklin.*] Is not provision made on the tributaries to supply pastoral holdings? Yes; on all the natural channels there are waterholes, and they are maintained sometimes by raising the lower bank a little.

438. You have no means of raising the crest of the weir by shutters? Yes, at Glenorchy and some of the other weirs there are movable planks or shutters.

439. Do you think it possible in taking off the sides to carry the water above the surface of the country? Yes, to a small depth.

440. Sufficient to distribute water by gravitation? Yes, small channels could be treated in that way.

Retentiveness of soil.

441. It is a question whether the soil of our country is sufficiently retentive to suit the scheme you speak of? Soils get retentive afterwards. At one or two of the places where the bank and the weir are above the surface, squatters' old dams, above the creek, have been retained and furnished with by-washes or weirs, and these retain the water.

442. *President.*] Have you any knowledge of the New South Wales river system? I have seen the Darling, but only from Wilcannia downwards, and the country about Deniliquin. There is a river there called the Edwards, which I have seen again lower down.

443. *Mr. Murray.*] Would the system adopted in Victoria be suitable here? I think so.

Floods of the Darling.

444. *Mr. Franklin.*] Above Bourke the north-western country is flooded after heavy rains? I do not think there have been floods in Victoria so heavy as those on the Darling, if they are so heavy as I have read of their being.

Retention and distribution of flood-waters.

445. It seems that if the very large area of water in case of floods could be retained and its distribution regulated, we might avoid the ill effects of floods and provide for a plentiful supply of water when it is needed? I think the Murrumbidgee is very much like the Murray in character, and that much of the flood-water of that river could be saved.

Storage of storm-water.

446. *Mr. Townsend.*] If all the available storm-water were stored at the Wimmera before it gets to the flat country, would there be sufficient for an irrigation supply? There would be in most years, but I do not think there would be found a convenient place for storing all of it.

447. How many acres in the mile could you count on to supply for perfect irrigation, leaving other water to supply the stock? I am not prepared to say directly, but will send an estimate. (*Appendix D 6.*)

Scale for maps.

448. What do you recommend as the best scale for the maps to be used in the examination of the country for a scheme of irrigation? About 2 inches to the mile is a very convenient scale.

Success of the Wimmera scheme.

449. *President.*] Does experience so far in Victoria induce you to go on with the works you have commenced? Yes. This Wimmera scheme with regard to which you have been examining me has been extremely successful—people are much pleased with it. Some of the others people profess not to be pleased with, because they do not serve for irrigation purposes, for which they were not intended.

Alterations in designs or plans.

450. Have you seen any reason to correct errors in designs or plans to any large extent? Not to any great extent in the general design; in fact most of the Trusts applied for loans to carry out our schemes. In details some alterations have been made, but the general scheme has been carried out in most cases.

Surveys.

451. On what system of survey do you base the preliminary operations? We make a reconnaissance of the country, and get all the levels that may have been taken for the railway surveys. Where it was necessary we sent a surveyor to take a few lines up and down the district under examination, and then we sketched in roughly what channels were likely to be required.

452. Did you take levels connecting the rivers? Yes; we divided the country into a series of areas, according to the river systems, and took levels right across each at intervals, and also along what we knew to be the probable line the channel would take.

453. Were these lines of survey levelled and plotted? No, the areas were not plotted as sections; the levels were marked on plans. Most of the country in the northern plains is subdivided by roads and selection fences, and the surveyors mark what is necessary to plot on the plans.

Floods on lower part of the Wimmera.

454. Is the Wimmera liable to heavy floods on the lower part? The town of Glenorchy has been flooded, and I think the town of Horsham, but I am not sure.

Rising of river-bank by silt.

455. Is there not a perceptible rising of the banks of the rivers, caused by silt? Yes, there is generally a fall from the river bank outwards. In many cases it is a dead level; in others there is a slight fall.

456. Is the construction of the weirs legalized? Yes, under the new Act.

Area supplied with one cubic foot of water.

457. *Mr. Gipps.*] How many acres is it estimated that a cubic foot of the water so arrested under your system will supply? I calculate when they have a good system of irrigation 4 acres per cubic foot per minute. Pasture land will take a good deal more water.

458. That is the Indian scale? In some cases, but it varies in all countries.

459. *Mr. Donkin.*] You have not actually distributed any water through the summer months from the Wimmera? No, there is none to distribute.

Fixed weirs with movable crest.

460. *President.*] Which do you consider most applicable, movable or fixed weirs? Fixed up to a certain height, with a movable crest.

461. *Mr. Gipps.*] That is where there is a declivity? It is to make room for the flood-water. In most cases we have had to deal with flood-water of such large volume that we could not take the weir to the top of the bank unless it was made movable.

462. In all weirs you think a portion of them should be movable? Yes, in rivers subject to floods we make them movable, although it may make the expense much more.

463. *President.*] In reference to the weirs, would the fixed part cause the river to silt up? I think so, in some cases just immediately above it. Mr. G. Gordon, C.E.
464. But will the silting cause any great trouble or damage? I do not apprehend any trouble from it. 7 Aug., 1884.
465. How many separate schemes have you similar to those on which you have given information this afternoon? There are six in progress: the Goulburn scheme, the Gunbower or Murray scheme, the Loddon scheme, the Avoca scheme, the Wimmera scheme, and the Broken River scheme. There are more Trusts than those, but these are the only schemes which deal with the rivers.
466. *Mr. Murray.*] Are those on the south side of the range? No, on the northern.
467. *President.*] If you apply your scheme to the Murray you would have to put a movable by-pass to leave the river navigable? If a weir were placed in the Murray you must, in order to make the river navigable, have an opening in the weir down to the level of the bottom of the locks at the end of it.

FRIDAY, 8 *AUGUST*, 1884.

Present:—

Mr. BARTON, M.P.,	Mr. LYNE, M.P.,
Mr. DONKIN, J.P.,	Mr. MURRAY, M.P.,
Mr. FRANKLIN, C.E.,	Mr. M'MORDIE, C.E.,
Mr. GIPPS, C.E.,	Mr. TOWNSEND.

W. J. LYNE, Esq., M.P., in the Chair.

Mr. George Gordon, C.E., further examined:—

468. *President.*] You produce a report of the various schemes on which you have been engaged in Victoria? These are the reports of the Victorian Water Conservation Board. There are two reports subsequent to these, but they are on irrigation. Mr. G. Gordon, C.E. 8 Aug., 1884.
469. Which is it that you say deals with irrigation? The Gunbower scheme; but it does not profess to irrigate by gravitation; but as a large quantity of water is brought into the natural channels, people pump it up for themselves. Gunbower scheme.
470. Have you the scheme here? Yes. There is a natural outflow of the Murray River at a point 16 miles below Echuca; that outflow forms into a creek which runs nearly parallel with the Murray 4 to 6 miles back from that river. Outflow of the Murray.
471. And flows a distance of 45 miles? Yes. There are two other outflows from the Murray which join that creek, one called Deep Creek 10 miles below.
472. Where is the other one? At Bagot's Creek, which is well defined, except at the head, and the Trust have opened up the heads of both creeks to let in early flood-waters.
473. How are the heads protected? At present only one is protected, but all are to be protected with sluices. At present this is hardly necessary, but it is intended to clear the channel at Gunbower Creek and then put a sluice at the head. Protection of heads.
474. Will these sluices be carried to the bed of the creek, or is it only intended to meet cases of inundation? They will shut off the full depth of the creek. It is purely to save expense in waste weirs at the dams. There are here some old station dams and others, and if they have the water well under control at the head, waste weirs will be a matter of more easy construction, otherwise they would be rather troublesome. Sluices.
475. Where the water is controlled by sluices, is there any visible diminution of water below—when heads are formed, is there a diminution of natural water in the original river-bed, so as to give rise to complaint? It was complained of at first in the case of Glenorchy River, but under a misapprehension; they did not understand what amount of the water was to be taken away. We insist on the sill of the sluices in most cases not being lower than the sill of the weir, so that only a certain proportion of the water may go down the channel.
476. Is the water that goes in these ordinarily dry channels simply the flood-water? Yes.
477. And the cuttings are deepened? That at the head of Gunbower is not yet deepened to the full extent intended. Deepening of cuttings.
478. About what season of the year does most water come into that creek? Generally it begins to flow in June and July, and lasts till November of the same year. Season of greatest water supply.
479. That is during the spring? During the full supply of the Murray.
480. Are there many weirs constructed along that channel? At present only one, and these are only earthen dams, and some of them are to be converted into weirs. They are old dams; there is one new one near Gunbower station. Number of weirs.
481. Has the water been diverted from that channel anywhere along its course? There is a natural outflow from the Gunbower channel at Gunbower into the Kow Swamp; that flows out again by the Box Creek, which runs nearly parallel to the Gunbower Creek. Outflow from the Gunbower channel.
482. Does the water come along that channel at the same rate as the water along the Gunbower Creek? It takes a little longer when the water is from the river. The swamp has also a supply from the Pickaninny Creek. Supply from Pickaninny Creek.
483. Where does that come from? From the neighbourhood of Sandhurst.
484. That is part of the Gunbower scheme? The Gunbower scheme includes the Kow Swamp, but not the Pickaninny Creek.
485. Where is the water taken out of the Kow Swamp? Down Box Creek, which joins the Pyramid Creek. That is also a local drainage, and they flow into the Loddon near Kerang. Outlet of Kow Swamp.
486. Do they flow by a natural channel? Yes; it is very ill defined in some places. In some places there are water-holes, in others dams cross it.
487. The connections are made always by cuttings between the waterholes? They have not done it yet: there is a sufficient flow to give all the water they need down the Box Creek for domestic use and stock watering. Connection between water-holes.
488. How much further? It flows to the Loddon below Kerang. After Pyramid and Box Creeks join they flow into the Loddon at that place.

489.

Mr. G. Gordon, C.E. 8 Aug., 1884.

489. Are these head waters to this scheme? No, except for the lower part of the scheme. Here the Loddon water is included after the creeks join, and the waters are taken off and fill a chain of lakes known as Lake Charm, the Middle Lake, Reedy Lake, and Kangaroo Lake, &c.

Area of lakes.

490. Have you any idea of the aggregate area of these lakes? No; they are shown on the map with distinct boundaries, but they are merely a collection of swamps; though Lake Charm is a well-defined deep lake.

Extent of irrigation.

491. To what extent has irrigation been carried on, if it all? It has been carried on by private individuals from these creeks by pumping. I have a table of irrigation results for last year.

Irrigation results.

492. All in connection with this scheme? No; irrigation all over the Colony; it was got up by the Government Statist. The scheme I have been referring to is named the Swan Hill scheme.

Particulars about Swan Hill scheme.

493. Will you give the particulars connected with it? The table shows that the number of acres irrigated is 5,580; the total number of farms, 1,241; the total number of farms on which irrigation was practised, 88; the cultivation, 92,648 acres of not irrigated land, and 5,580 of irrigated. It gives the results, but they give an imperfect idea of the effects of irrigation, being only the results of one year. There is an average giving the produce on land irrigated and that on land not irrigated; but that applies to all the Shires. (*Appendix D 7.*) It was not a favourable year to show the advantage of irrigation, because it was a particularly good year for rain. The wheat not irrigated was 13·11 bushels to the acre, irrigated 16·31; oats not irrigated 24·44, irrigated 33·30; barley not irrigated 14·70, irrigated 31·35; potatoes not irrigated 2·87 tons, irrigated 5·80 tons; beet, mangold-wurzel, &c., not irrigated, 17·32 tons, irrigated 19·29 tons; hay not irrigated 1·13, irrigated 1·67 tons; chicory irrigated 5·59 tons, not irrigated 8 tons; hops not irrigated 8·78 cwt., irrigated 10·49 cwt.; tobacco not irrigated 3·14 cwt., irrigated 4 cwt.

Water raised by centrifugal pumps.

494. How is the water raised for irrigating by this scheme? Generally by centrifugal pumps.

495. Not by gravitation? There is no irrigation by gravitation in the Gunbower scheme.

Fall.

496. What is the fall between the two points, the head works and where the water joins the Murray again? Where it goes into the lake, which is really the end of it, there is a fall of 67 feet.

497. That is about 40 miles? About 45 or 48 miles.

498. The average being about 1 ft. 4 in. per mile? About that.

Area supplied.

499. What extent of country is supplied by that water? 578½ square miles.

Cost.

500. Do you know the cost? Up to the present it has been £39,000; but that includes the supply of two towns, Swan Hill and Kerang.

501. Will you roughly average the cost per acre? It is about 2s. Each person who wishes to irrigate takes the water out of the creek in front of his land.

Irrigation by pumping.

502. How is the 5,580 acres irrigated? That is done by pumping.

503. *Mr. Donkin.*] Have they been charged anything? Not yet. No rate has been struck, the works being incomplete. The Swan Hill Trust and the Trust of Gunbower cannot levy a rate for irrigation, but they can sell water.

Measurement of water.

504. *Mr. Gipps.*] Is there any measurement per acre of the water drained off for irrigation? No.

Rate.

505. *Mr. Franklin.*] Has it been suggested that in levying a rate the measurement should be for irrigated land per acre? No power has been given to sell water for any purpose by measure.

506. *Mr. Donkin.*] Would there, by this scheme, be a sufficient supply for a number of farms which went in for irrigation? It could be made sufficient, as it all depends on the creeks flowing from the Murray.

Size of cuttings.

507. *President.*] About what size are the cuttings? Only about 8 or 10 feet bottom at the heads.

Constitution of Trust.

508. How is the Trust constituted with regard to the Wimmera Trust—is it similarly constituted? The Wimmera Trust comprises three Shires; this Trust is comprised in one Shire.

509. I mean the constitution of the Trust and its power? The power is the same, but the constitution slightly different, because there is only one Shire in the Swan Hill Trust.

Flow of water in the creeks.

510. *Mr. Franklin.*] If the water running into these creeks flows down the natural channel when there are freshets, does any portion of the water recede again as the freshets discontinue? No.

511. It does not run in at the heads? No, it cannot return to the river—so long as the river is above the level outlet the water flows down the creek.

Beds of the creeks.

512. In that case the beds of the creek are rather higher at the inlet than the bed of the river? Yes, much higher.

Supply of creeks.

513. *Mr. Barton.*] These creeks are only supplied during floods? During floods only.

514. *President.*] I should think the supply would be about September, when the snow water is coming down? September I think is the month when the water is the highest. I made an average of the various heights, and I think August and September are nearly equal.

Irrigation by gravitation.

515. *Mr. M'Mordie.*] With a fall of 67 feet, or 1 foot 4 inches per mile, would it not be possible to irrigate by gravitation? It would in some places.

516. Then what are the difficulties of a gravitation scheme being carried out? The principal difficulty would be the want of co-operation among the farmers themselves, the difficulty of obtaining land for the channels, and the cost of the main channels.

Difficulties from persons living lower down the diversion point.

517. *President.*] Has there been any difficulty among the persons living lower down on the ground that the water has been diverted or stopped? Not in this Trust, as regards the works constructed by the Trust. Threats have been made of cutting some of the old dams.

Flood outlets.

518. *Mr. Gipps.*] You say that the mouths of these creeks are higher than the beds of the river? Yes.

519. And when the floods recede the water does not run into the creeks? No.

520. Is there no declivity? From the river?

521. No; the declivity is along the bed of the creek *from* the river towards the bed of the creek? These are outlet creeks from the river.

522. Not natural watercourses or tributaries? No, all flood outlets.

Initiation of Gunbower scheme by Shire Council.

523. *Mr. Donkin.*] Was the work in the Gunbower scheme initiated by the Shire Council or by the Government? It was at the instance of the Shire Council, who made application to be formed into a Trust to carry out the scheme which Mr. Black and I proposed; but now, I may say that a large number of the people would like to see an irrigation scheme substituted.

524. I understand that the Gunbower and these other creeks are ana-branches? Yes.

Water gauges.

525. Have you a gauge at these creeks or at the Murray River to ascertain the body of water passing down? No, we have not gauged the creeks. There is a river gauge at the Echuca, another at Swan Hill, and one at Koondrook, near Kerang. I had the Murray gauged at Koondrook during the driest summer they had had for a great many years.

526.

526. In opening up these different channels is there any tendency to silt? No; there must, however, be a slight silting somewhere, because the water flowing from the Murray is tolerably muddy, and lower down the creeks it is clearer.

527. I understand that there is a chain of ponds? These creeks with the water-holes remain the same.

Silt.

528. Do these large water-holes silt up? In some districts where mining is carried on in the upper part of the creeks, the water-holes have filled up.

Estimate of irrigation with Gunbower scheme.

529. Could you give me a rough estimate of the probable cost, if a system of irrigation were carried out, in connection with the Gunbower scheme? No; I have not yet made a proper estimate; I have it in hand. I made a rough estimate, which will be found among the papers coming to hand. (*Appendix D 8.*)

530. *Mr. Townsend.*] You spoke just now of the inhabitants being in favour of substituting a scheme of irrigation: where would you expect to get the water from? From the Murray and Loddon.

Irrigation by gravitation from the Murray and Loddon.

531. By pumping or by gravitation? By gravitation; but I think they would also have to pump, because the water does not come down early enough. They want the water in May for irrigation, and the Loddon is a very uncertain river, but it could command also the upper part, if the volume was sufficient. The Loddon is diverted at Bridgewater, and it might give a certain amount of supply to the whole of this scheme.

Discharge of Murray at Echuca.

532. *President.*] Do the observations made at Echuca enable us to know the annual discharge in proportion to the rainfall? No, not yet. There will be data for that by-and-bye; but the discharge has not yet been measured at the different stations on the river; when that is done we can get at a correct average of the quantity discharged. The only measurement we made on the Murray is as to the minimum discharge at Koondrook in the summer of 1881–82, which was dry: it amounted to 50,000 cubic feet per minute.

Discharge at Koondrook.

533. What rainfall would that represent over the river? I cannot say. It might not have rained for two or three months before that.

Dams carried away by floods.

534. How are the earth dams affected by sudden floods? They are frequently carried away. The old squatters' dams were all liable to be carried away occasionally. That was only because they were not provided with proper by-washes.

535. Are they provided with waste weirs? No. Those taken over by the Trust are, however, so provided, or will be.

536. In consequence of not being properly supplied with them the dams were carried away? Yes, or the river cut a channel round them.

537. Is the timber dam quite successful? Yes.

Inundation.

538. Are the creeks that have been mentioned in this scheme capable of carrying the fullest quantity of water in times of flood without inundation? No; in very heavy floods a great part of the country is under water.

539. Would more extensive head works impound a much larger volume of water? No.

Water lost through heavy floods.

540. Then the water that inundates a large part of the country in heavy floods is lost? Yes, it flows off again into the Murray. A good deal of water could be stored in the Kow Swamp.

Storing tanks.

541. Is it contemplated to make storing tanks? Yes, for stock purposes only. But it is intended also to retain some water in the Kow Swamp.

Plough furrows to fill tanks along old creeks.

542. In this and the other schemes you refer to, is it usual for the farmers resident in the neighbourhood to have the water in any way running to their tanks and dams that are off the water channels? Yes; a plough furrow is made to fill their tanks along the old creeks, and a good number of tanks are excavated in the beds of the creeks. They disappear in the flood season, being covered by the flood.

Farmer Garden.

543. There is some farmer living in this neighbourhood who has been carrying on irrigation to a large extent—do you know his name? Yes, his name is Garden; he writes to the *Australasian* occasionally about it. I think his farm is described in a series of papers called "Irrigation Experiments" in that paper.

544. *Mr. Townsend.*] Is it done by pumping or by gravitation? By pumping. He lifts the water 5 or 6 feet from one of the dams on these creeks.

Expense of preparing land for irrigation.

545. *President.*] Have you any idea of the expense of preparing the land in those cases where irrigation is carried on? Very little is done in this country, which is naturally extremely flat; the only expense is in making an embanked channel to the farm, and pumping into that. I do not know what the expense would be. They do not like to tell what it is; and when they do tell it the information is vague, as they may employ their own men and carts, &c.

Loddon scheme.

546. Is there any other water scheme in the plan before us? Yes, two others—the Loddon scheme, which is being carried out, and this Campaspe scheme, which is not being carried out.

547. At what point do you take water from the Loddon? At Bridgewater, by means of a concrete weir.

548. And open cutting? Yes, on the east side of the river for about 3 miles.

549. What size? I think it is nearly a 6-feet bottom.

Water let into Bullock Creek.

550. At what distance is that water cut off? We pass the water into the Bullock Creek, a natural water-course which flows to the Box Creek, a distance of about 50 miles. There is nothing done at this part of the Loddon scheme except the head sluice at Bridgewater and the cuttings which are in progress. There is another weir in course of construction at Kinypaniel.

Timber weir.

551. What description of weir? Timber.

Kinypaniel weir.

552. How far is that down the Loddon? About 28 miles. The Kinypaniel weir is intended to throw the water into the Kinypaniel Creek, which is an outlet in flood-time; it is to fill Lake Boort and other lakes. It is about 12 miles down.

553. Is there any place where the water is taken out? It is proposed to take it out about 4 miles higher up, on the east side of the Loddon.

Works in Kinypaniel Creek.

554. What works are there in the Kinypaniel Creek? None except the head sluice.

555. And the cuttings? There is a slight cutting at the head sluice, perhaps three-quarters of a mile, made by the squatters long ago, and enlarged by the Shire Council. The outlet in the eastern side is not begun yet. There is a natural outlet called the Serpentine Creek, flowing parallel with the Loddon, and the mouth of that has been deepened for a distance of 2 miles. There are the remains of a weir at Serpentine Creek which was washed away. Instead of making a new weir they deepened the cutting.

556. That creek is midway between the Kinypaniel weir and the Bridgewater weir? Yes.

Discharge of water from Loddon into Gunbower.

557. The water taken on the eastern side of the Loddon discharges into the Gunbower scheme? Yes, and eventually into Lake Charm.

558. Are there many works on these various channels? These are natural creeks on which there are old station dams repaired and furnished with weirs, and many tanks are excavated here and there.

559.

Mr. G. Gordon, C.E. 8 Aug., 1884.

559. What area of country is supplied by that scheme? 1,273 square miles.

560. At what cost? Up to the present the cost has been £37,000.

561. The cost then is about seven-eighths of a shilling per acre? Yes.

Area supplied. Cost.

562. In the three schemes referred to, the cost I find is only the actual expense up to the present time? That is all.

563. In each case a larger sum of money will have to be expended? Yes. In most cases they desire to spend more; in some cases the loans were not sufficient for the works; in other cases they wish to extend the works.

Conditions for filling private tanks.

564. *Mr. Franklin.*] Under what conditions are the channels made in these distributaries to fill private tanks? I do not think the Trust have made any regulations—in fact I believe that they are only now beginning to frame regulations.

565. There would be a system of gauging established to regulate the supply? I do not think they would sell the water by measure for stock watering; the people would be rated for the purpose of paying the interest on the loan. Then if they wished to sell an additional quantity of water, they would I suppose measure it in the tank.

Rate.

566. *President.*] Has any rate been made or levied in connection with this scheme? No; it is proposed.

567. *Mr. Townsend.*] Have you come to any conclusion as to the cost per mile or per acre for working of this scheme? No, but they will be small in proportion to the first outlay.

Distribution of water.

568. *Mr. Donkin.*] How is the water distributed in the 5,500 acres—is it by small drains or otherwise to the farms? They just open the bank and let it run out.

569. *President.*] With a spade? Yes.

570. *Mr. Donkin.*] There is no system of ploughed drains? No. I think some of them have taken that course, but all are working in their own way at present.

The Campaspe scheme.

571. *President.*] Referring to map No. 2, you have three schemes there indicated (*Appendix D 9*)? Yes. The Campaspe scheme is not being carried out.

572. Is it likely to be carried out shortly? I think not, from the fact of the people wishing to go into an irrigation scheme in the lower part of the district, the water to be got by pumping from the Murray. The Campaspe is too irregular a river to be depended on for irrigation.

573. It is proposed to take the water from the Campaspe River? Yes. It was proposed to carry a channel from above a weir on the river to the Pickaninny Creek.

574. It is abandoned in consequence of the opposition of the people below? Yes. They will not join in it because they want an irrigation scheme to include the north part from the Murray by pumping.

Pumping scheme.

575. That scheme is similar to the Gunbower scheme? It would be entirely a pumping scheme. There is no natural outlet from the Murray, and the water would have to be lifted 27 feet or more. Then the water would have to be carried in a canal running due west to the Pickaninny Creek.

576. That is not being carried out? An application has been made for a Trust to be formed, but there is some difficulty in reference to the money. The Government do not lend money for irrigation schemes.

Raising of money.

577. Then how is the money obtained for the Gunbower scheme? That is not an irrigation scheme, although it has been used for irrigation by people at their own cost.

The Echuca West Riding irrigation scheme.

578. That is called the Echuca West Riding irrigation scheme? Yes. It is a very favourable country for irrigation.

579. It is purely an irrigation scheme? Purely.

580. And the Government have not provided any means for that purpose? No.

581. I presume that they are not likely to do so? No, they say not.

Irrigation from wells.

582. *Mr. Franklin.*] Are there any special improvements for irrigation from wells in this area? I do not think there are any in this Trust. In the St. Arnaud Shire and the Lowan Shire Trusts they sank a good many, but not for irrigation.

583. At what depth do they find the water? From 130 to 200 feet.

Appliances for storing the water.

584. Have they any special appliances for storing the water? They use horse-whims, which pump it into tanks, from which it is delivered into carts. Some use windmills, and add a small excavated tank to take the surface water.

Brackish water.

585. *President.*] Is the water pumped for these wells good for irrigation purposes? They only pump from them for stock purposes; the water is slightly brackish.

586. Would it be destructive to vegetation? I do not think it would. Some wells are more brackish than others. Having to lift to that height I do not think that they could irrigate at a profit, nor would the well yield a sufficiently large flow of water.

Permanency of supply from wells.

587. *Mr. Franklin.*] Is there a large and permanent supply of water from those wells over that area? I have heard of only one well that has not turned out a success. It is said that they have been equal to present requirements.

Underground supply.

588. Does it appear to be a good underground supply? No, not in the Lowan Shire. The underground supply is uncertain. They get water in some parts of a district, and in a similar district they get none, or very little; they have got to the bed-rock without striking water at a depth of 450 feet. That was the case at Jaen.

Quality of water.

589. *Mr. Townsend.*] Do you see any marked difference in the quality of the water at different places? I do not think there is much difference. In some places they can get only brackish water; but the nearer the surface the better it is.

Lower Avoca scheme.

590. *President.*] What plans of other schemes have you here? There is the Lower Avoca scheme. (*Appendix D 10.*)

591. Where is the water taken from by this scheme? The principal object of the Trust is to store water in the river Avoca, which has been known to be three years without water in it. They have constructed a small weir at the town of Charlton.

592. What sort? A timber weir. They have constructed three more at intervals of about 8 miles down the river from Charlton. The Charlton weir is a very small one, only sufficient to hold up the water to pump from, and they supplied the town by pumping. Now they are going to bring in a supply from about two miles off by gravitation. Then where the Mosquito Creek leaves the Avoca they have regulated the flow a little, but there is no weir there. Lower down there is to be a weir, perhaps near the Mosquito Creek, to regulate the outlet and supply the Lalbat Creek, and the Back Creek, which is a very small

creek

creek at present, flowing parallel to the Avoca at a distance of 3 to 6 miles. Lalbat Creek leaves the Avoca and flows into Lake Lalbat. Three more weirs are proposed higher up above Charlton, but the present loan is exhausted, and it depends on the Trust getting a new loan whether they will carry this out or not. The other works of this Trust are chiefly surface tanks. Mr. G. Gordon, C.E. 8 Aug., 1884.

593. *Mr. Barton.*] Filled from the creek? No; by surface drainage. There are tanks all along the Lalbat, and no doubt there are some which are filled by it.

Rainfall.

594. *Mr. Townsend.*] Have you any record of the rainfall there? Not at the source.

595. Or about the locality at which the tanks will be made? It is about 16 inches I should think.

596. *Mr. Gipps.*] What was the object of the three weirs? To keep the water in the river. This country is absolutely dry in the summer, the little creeks only run in a heavy rain, and when the river comes down rapidly it falls in a couple of days.

597. Then they will make off-takes? No, that would require deep cuttings. They propose to make one off-take 4 miles above Charlton, to go to the east, and I doubt whether it will be a success. The ground does not hold well.

Source of the Avoca.

598. *Mr. Barton.*] Where does the Avoca take its rise? In the Pyrences, a part of the Dividing Range. It rises in a place called the Amphitheatre.

Area of its basin.

599. Have you any knowledge of the area of country it drains? It drains a comparatively small area. There is only an intermittent supply.

600. *Mr. Gipps.*] Would the natural features offer any advantage for conservation? No; there is a gap where a dam could be made, but there is no supply to fill it.

601. What are the objects of the whole scheme then? Simply to conserve water in the river and make tanks in favourable places.

Porous bed of river.

602. *Mr. Barton.*] Not for irrigation purposes? No, there is not sufficient water. The bed of the river is very porous. I think the water for some years will go away; but these weirs hold up the flood-water and encourage a deposit of silt, so that the gravel will be choked in the course of time.

Area supplied.

603. What area will this supply? It is difficult to estimate, because the tanks are dotted about irregularly. It will supply a length of 60 miles, by 6 miles in width, and other detached portions. They speak of diverting water at Koonoon to fill Watson's Lakes, but it would be very expensive, and is not likely to be carried out.

Cost.

604. What is the cost of this scheme as far as it has gone? £19,000. I can hardly estimate the cost per acre of supply, because it is difficult to say what you consider a supply.

Law regulations.

605. *Mr. Gipps.*] What is the regulation under which water is allowed to be taken from the tanks? They have no regulation.

606. Can any one take it off as they like? No; there will be a law question about that. They were to have had the control of the creeks, but that they cannot get, as it passes private land. But they will make regulations as to the drawing off of water; indeed most of the tanks will be made by the Trust themselves.

607. This is being carried out by a Trust then? Yes.

Raising of money for the scheme.

608. *Mr. Barton.*] Who found the £19,000 for this scheme? The Government gave the Trust a loan of £15,800 and a grant of £3,600. The grant was distributed among the Trusts in operation.

609. Is it not supplemented by the holders of land? They are supposed to pay a rate to meet the interest on the loan, and partly to go to a sinking fund.

610. *Mr. Donkin.*] Any Shire can make application to the Government for a loan to carry out a water scheme? If the scheme is approved and the applicants show that the parties can pay the interest on the money at a moderate rate.

Water Conservation Acts of 1881 and 1883.

611. As to Water Conservation Acts of 1881 and 1883, have they worked well? Not quite satisfactorily, yet I think the dissatisfaction is chiefly as to the working.

Rights to the banks of the creeks.

612. *Mr. Gipps.*] Do the owners of land on the banks of these creeks have any right to the banks of the creeks, or have the Government reserved the right? In some cases there has been a reserve along the banks of running rivers; but in old times the land was sold, and with it there was a right as far as the middle of the stream.

613. Then the Trust has purchased the land? Or got permission to use it where they constructed works—a perpetual easement from the landlord without purchase.

Rights to the bed of the stream.

614. Would that give a right to the bed of the stream? Yes, if they desired to construct works in the bed. It would depend on what they take it for.

615. *Mr. Donkin.*] I suppose most of the occupiers and owners fall in with the proposals? They are willing enough to do so, but are anxious to get compensation. Some of the works are delayed owing to exorbitant prices being asked.

Power of the Trust to appropriate.

616. *Mr. Gipps.*] How do they deal with the water then? In one case the works were stopped until satisfactory arrangements were made. The Trusts have power to take land, or the Board of Works can, the value being fixed by arbitration if the parties cannot agree. That part of the statute was incorporated in these Water Conservation Acts.

617. *Mr. Donkin.*] So far, the working appears to be that those people in the Trust area take as much water as they like without paying for it? They have not been asked to pay anything for it by the Trust; but the Government have reminded the Trust that the repayments should begin, but the Commissioners say that the work not being finished a rate cannot be levied.

Repayment of loans.

618. *Mr. Barton.*] Do you find these Trusts constituted as they are have worked well? Some of them work well, some not well; I think it depends to a great extent on the *personnel* of the Trusts.

Working of the Trusts.

619. *Mr. Donkin.*] Do you know what is the rainfall at the Amphitheatre at the head of the Avoca? No; I do not think there is a gauge at the Amphitheatre itself, but I am not sure.

Rainfall.

620. *Mr. Townsend.*] Is not that place near St. Arnaud's? Not far away.

621. *Mr. Donkin.*] Have the Government taken steps to obtain more definite information as to the rainfall? The Government have done a little, but the Astronomer gets returns from many private individuals. The Government have given permission for a systematic gauging of all the principal rivers being made.

Gauging of rivers.

622. But nothing has been done with regard to the rainfall except getting reports from private persons? Gauges are kept by many Government officers in addition to the private gauge.

Floods of the Avoca.

623. Speaking from your experience, do you think there is sufficient rainfall at the head of the Avoca to supply these channels for irrigation purposes? No, the floods last only a few days.

624. Not i fthe water were conserved or dammed at the heads? No. The water does not come down for several

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several years. There is no good supply for a large reservoir; but a moderate one may be made a short way below the Amphitheatre. There is little catchment. The Avoca River ends in Lake Bael Bael, and has been traced 6 miles further north.

Mallee country. 625. Do you know whether in the mallee country irrigation or clearing has been tried? They have tried clearing. It is intersected by many sand ridges, and it does not hold any water; no creeks run in the mallee or out of it.

Cost per acre. 626. What is about the cost per acre of this scheme? About 1s. 8d.; but there are other districts supplied with tanks dotted here and there which this Trust has the management of.

627. But taking the whole area in this county? I have taken 60 miles by 6 as area of country benefited by the works on the river. The chief works are for storing water in the bed of the river; the others are tanks and dams.

628. Are there many wells? Not many sunk by the Trust.

629. To what depth do they generally go? I do not think this Trust had sunk any. They have spent some money in boring.

Gravelly bed of Avoca. 630. You say that the bed of the Avoca is rather gravelly, but that there is a hope that it will be silted up so as to bind the gravel? Yes.

Soakage. 631. Do you think that much of the water escapes by soakage? Yes, because in a big flood the river up above Charlton is a very formidable-looking stream, but down towards the north end it is insignificant.

632. I suppose no survey has been made by boring to trace any underground current? The Railway Department made borings to find a place for a bridge and found gravel to a considerable depth, but I am not aware of any survey having been made to trace the drift or the underground soakage.

633. *President.*] Is there very much silt? Not much—I should like to see more.

Nature of silt 634. Of what nature is the silt? Clayey.

The Goulburn scheme. 635. There is another scheme? Yes, the Goulburn scheme, which is one of the most important. (*Appendix D 11.*)

636. Where is the water taken from? It was originally proposed to take water from the Goulburn, about 8 miles above Murchison, from above a weir, and to carry the channel in a westerly and northerly direction to the Campaspe.

637. Is that being carried out? Only part of it; the weir was found to be so difficult in construction and so expensive that they intend in the meantime to take water a few miles lower down by pumping it from the river.

Height of weir. 638. What was the intended height of the weir? About 40 feet.

639. Of concrete? No, timber. There would need to be concrete walls and puddle to cut off the drift underground, but the main structure would be of timber.

Channel from Waranga basin to Wanalta Creek. 640. Is the channel completed? It is in course of construction from Waranga basin to Wanalta Creek. It is continued thence to Cornella Creek and Lake Cooper, and is complete to that point. It is also very nearly completed, as a drainage line runs from the Waranga and Cornella Creeks, northwards, to the parish of Koyuga. The reason for taking up this point was, that there is a considerable natural drainage into that locality, and the water could be conserved and taken down the natural drainage channel pending the construction of the weir, which would occupy about four years. Tanks have been dug along the course of the channel. The intention, of course, is as shown to distribute the water all over the district. There has been a delay in carrying out the scheme, because when the application was sent in to carry out the Goulburn scheme of the Water Conservancy Board they wished to make the channels large enough to carry water for irrigation, and as the Government were not lending money for irrigation they were requested to reduce the channels. But at last they obtained permission to carry out their plan, if they could do it with the amount of loan applied for. Then they found a difficulty about the weir. I resolved on a temporary measure, with a pumping establishment at Murchison, to pump a supply for domestic and stock purposes, and also for a small amount of irrigation.

Natural drainage.

Channels for water for irrigation.

Pumping establishment at Murchison.

641. Are they doing that now? They are just beginning; the other work has been going on for more than a year.

Dimensions of canal. 642. What is the length of this canal? About 70 miles.

643. And what size? 4 feet 6 bottom width; slopes, 1 to 1.

644. *Mr. Townsend.*] Is that the outcome of what is known as Dodd's scheme? No.

Branches. 645. *President.*] Are not branches taken from the channel? It is proposed to take channels down the higher portion of the country, but it is not surveyed yet.

Area supplied. 646. What area of country is it proposed to supply with water? 800 square miles.

Cost. 647. What is the estimated cost? £143,000. There is no application for an additional loan for this.

648. What is that per acre? 5s. 7d.

Character of Waranga basin. 649. What is this Waranga basin? It is a natural depression, with a good deal of water, though it is not very deep. It is shallower towards the north end than in the middle. It is a natural hollow, and it is proposed, instead of carrying a channel round the contour, to flume it across, and perhaps to conserve the water for irrigation. That is fully described in the two reports on irrigation.

650. What kind of country is that? Agricultural.

651. Is it level? Very level. There are two lines of drainage which unite towards the north-west. There is a sort of ridge parallel to the Goulburn and Murray Rivers, where the channels are to be carried, and a drainage to the north-west.

Depth of the channel. 652. *Mr. Donkin.*] What is the depth of the channel? 3 feet. It is a very small channel, but it is more than sufficient to give a supply for domestic purposes, but not to give enough for irrigation, except to a very limited extent.

Incline. 653. *Mr. Gipps.*] What is the fall? In one place 9 inches, but generally about 1 foot per mile.

654. *Mr. Donkin.*] What would be the head of water if the weir was completed—with so slight a fall would not the evaporation be very great? The weir would give no more fall.

Movable weir. 655. *President.*] Do you think that a movable weir would be more suitable than a stationary weir? It is proposed to make the upper part, to the extent of 10 feet, movable.

656. I mean with regard to the foundation? It would be very difficult to do that, the banks being very steep mud banks.

Volume of water in the Goulburn. 657. There is a large volume of water coming down the Goulburn? Yes. The difficulties would be great, because you have to raise the water 40 feet.

658.

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658. You do not think that a movable weir would be suitable? No, except the top part of it.
659. *Mr. Donkin.*] I think you said it was 80 miles long? About 70.
660. Would the water reach here in summer-time? Yes. There is very little loss in the Coliban channel, which is of similar dimensions.
Loss of water in summer.
661. The evaporation would be very great in the summer months? The absolute quantity of evaporation would not be greater than if there were a more rapid current, but the percentage of loss would be greater.
Fall of river.
662. *Mr. Gipps.*] What is the fall of the river at this place? One foot per mile. That is one reason why we could not go higher up. By going 10 miles higher up we could probably get a better foundation, but the expense would be enormous. The channel would have to be carried through difficult country the same distance.
Height of banks.
663. Would there be no means of diverting the water lower down? The banks gradually lower from 40 feet at Murchison. The banks at the Murray are fully 35 feet, and the ridge already mentioned parallel to the river would be an obstruction.
664. *President.*] How far is Murchison below Seymour? 30 miles by rail.
The Broken River scheme.
665. You have also the Broken River scheme? Yes; but it has been very much mutilated. (*Appendix D 12.*)
666. Where is that water taken from? The original scheme proposed to take the water from a point 6 miles below Benalla.
667. By means of a weir? A weir and cuttings.
Weir of stakes, sand, and fascines.
668. What kind of weir? It was intended to be a weir of stakes, sand, and fascines, and to be very broad.
669. Where is the water taken from now? From a weir at a place called Pine Lodge, about 20 miles lower down. This formed part of the original scheme. About 20 miles above Shepparton there is a cutting of about 2½ miles in length.
Clay-puddle wall.
670. What kind of weir is that? There is a clay-puddle wall across the middle, and a long slope down stream pitched with stone laid over bed of fascines.
Dimension of cuttings.
671. I think the water is taken by means of cuttings? Yes, 2½ miles in length, with 6 or 8 feet bottom width.
672. What are the side slopes? 1½ to 1 to 6 feet in height, and 1 to 1 above that.
673. What is the depth? The greatest depth is about 8 or 10 feet.
Khull's Range Creek.
674. How far do you take that down? There is an old natural watercourse below that, which needs clearing out. It joins another called the Khull's Range Creek; then it joins Broken Creek, which is in two branches, and flows into the Murray near Barmah. There are a great many dams on all the creeks, some of which need regulating, and some have been regulated by means of the addition of weirs and sluices.
Main channel.
675. Is the water taken off from that channel anywhere? No; there is only one main channel yet. They did intend to carry it off, but they have come to a stop, the Shire being separated into two; I think they are doing nothing except repairs to the weir at Pine Lodge, and constructing another at Barwo.
676. That scheme then is under two Shires? No; it was under only one, the Shepparton Shire—which is now divided into two, Shepparton and Shepparton South—and no determination has been arrived at as to the Trust. I have found that a channel taken from the Murray at Koonoomoo could be brought to irrigate a large tract of country; but that is not contemplated yet, and there is no proposal to do it. I was asked to find out whether it was practicable or not.
Distance from Pine Lodge to Barmah.
677. What length is it between Pine Lodge and Barmah? About 55 miles.
678. What is the approximate area of country it supplies? It can hardly be said as yet to supply beyond the parish of Mundoona; but when the creek is improved it will supply an area of 300 square miles.
Area supplied.
679. What area of country will that comprise? 300 square miles.
Cost.
680. Have you any idea of the cost? I do not know what they have spent, but a good deal more will be required. I think they have expended about £20,000.
681. What do you estimate it will cost to carry it to Barmah? About £30,000, probably, to complete that part of the scheme.
682. That would be about 3s. 0½d. per acre? Yes; that is taking it 6 miles across; but it was intended to supply the whole country that could be commanded.
683. That is not carried out? There was a talk about the union of the west half of the Yarrawonga Shire with the Shepparton Trust.
Irrigation of country above Benalla.
684. *Mr. Townsend.*] Have you examined the country above Benalla? This part may be irrigated by diverting the Devil's River, which is a wide, clear stream, into the Broken River.
685. You would bring it across by Mansfield? Yes. We are going to make a rough estimate of it. It would irrigate a large extent of country.
Summer supply of Broken River
686. *Mr. Gipps.*] What is the mean summer supply of the Broken River? It stops generally in summer.
687. How would you supply the canals? There are tanks to fill, and dams at intervals along the creeks, generally with a tank in the bed of the creek above them.
688. Would they throw back much water? Yes; there is one which would throw the water back 4 miles into a 6 feet depth.
689. The 6 feet would be only at the sill of the weir? Yes.
690. It would get shallower? But the channel could be cleared out.
691. Would not the tanks silt up? There is not much silt in these rivers.
Velocity of rivers.
692. *President.*] The rivers are not rapid there? No, they are sluggish.
Water storage in Victoria.
693. Then in Victoria you have no extensive scheme of water storage, only to distribute? It is mainly distribution, and storage in small tanks.
694. You have no extensive scheme to impound and conserve the water for distribution in the summer? No; it was not intended by these schemes, which were for domestic and stock supply, and if practicable, for irrigation.
Supply from Broken River.
Devil's River.
695. Is it practicable in this scheme? The Broken River in this scheme would not give a sufficient supply. The Devil's River might be brought into this river. The Broken River stops in the summer, but the Devil's River might be brought into it. It is a permanent river just like a good trout stream, with shingle in the bed.
696. *Mr. Donkin.*] Are the dams constructed by the Trust? Some were constructed by the Government, some by the Trust, and some are by private persons.
Overshot dams.
697. Are they overshot? Those made by the Government and the Trust are overshot.

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698. You have no plans? I have no plans of the weirs, except of the one at Dooen. All the weirs have given a little trouble as yet. I will let you have some sketches of those which have been successful. (*Appendix D 13.*) The Avoca River was the worst for trouble in construction. We have had considerable trouble with most of them, especially with that one on Wimmera at Glenorchy.

Plans of weirs.

Internal Trusts.

699. *President.*] Is there any other scheme? No, I think this is the last. There are internal Trust schemes for preserving water locally, but those I have mentioned are all the schemes proposed to be taken up by the Board.

700. How are these internal Trusts formed? By borrowing money and getting powers like those of the other Trusts.

701. How are the internal Trusts constituted—are they included in any way in the other Trusts? Take for example the Lowan Trust: a part of the Shire is made into a Trust District; they borrow a certain sum of money, and with it construct tanks and dig wells; then it is proposed to rate the people separately from the Shire rate.

702. But they have nothing to do with the schemes you have mentioned? Not with the rivers.

703. Nor with the water? In one case St. Arnaud's Trust joins the Avoca Trust, and they propose to make one or two weirs on the Avoca, but their principal works are tanks.

704. Are the members nominated or elected? When two or three Shires join, the members are elected from the Shire Councils of each Shire included, but one member is nominated by the Government. Mr. Black and I recommended that the Government nominee should be an officer of some standing in the Service, similar to that of a Police Magistrate; but they did not care about that, and nominated any one who was available in the district, and he has no important status. We thought he ought to be the Chairman, so as to keep the operations of the Trust within the Acts.

705. Do I understand that these are local Trusts having the management of the water supply inside the larger Trusts? No, not inside the larger Trusts; they are separate areas, and they have power to rate in their respective areas.

706. Suppose we have a large scheme such as you have described, and rate for the general distribution of water according to that scheme, could a small Trust have a distinct area in the centre of that scheme? No, it must be outside.

707. The internal Trusts have no effect whatever inside the other schemes? No, they are only internal as being confined to one Shire.

708. It is a distinct kind of class of Trusts from the larger ones? It has exactly the same power, but a slightly different constitution. For instance, the Lowan Shire is a pretty large Trust; they cannot divert water from the river. The St. Arnaud Shire Trust is comprised in the Shire and adjoins the Avoca, and they intend to make some works on that river, but the principal works are away from the river. These are both internal Trusts. Then, on the other hand, the Loddon Trust comprises parts of three Shires, and these Shires send two members each to the Commission.

709. These deal with underground water supply, and not a diversion of water from rivers? They can do both; they make surface tanks and so on.

Control over Trusts.

710. *Mr. Gipps.*] To what control are the Trusts subjected? The general designs and plans have to be approved by the Government.

711. Therefore no Trust could take advantage of its position in a higher part of the river? The Government look after that. It was part of our work to arrange the schemes so that by making a notch in the weir level with the sill of the outlet there might be a rough automatic distribution of the water.

Union of several Trusts.

712. *Mr. Townsend.*] Do you think it possible, in the initiation of a large national scheme for water supply and irrigation, to have smaller schemes interfering with it? If the larger scheme were promoted by anybody, it would be by the inhabitants of the districts where these Trusts are situated, and they would probably be absorbed in it. The Act provides for the union of several Trusts.

713. Suppose a number of these Trusts had established reservoirs at the head of a river where the main storage would have to be made, would they not have to be bought out? Yes. If an irrigation system is formed within one of these Trust areas, the Governor in Council is to decide which works of the original Trust they shall take over.

Examination of Darling River.

714. *President.*] In reference to the Darling River, you took a survey? I made an examination, but made no survey. I was furnished with the longitudinal section and plan, and made an examination from Wilcannia downwards to Wentworth, but I did not follow the whole course of the river below Menindie, but examined it here and there.

Locking of the Darling for navigation.

715. For what purpose was the examination made? For the purpose of a Navigation Company, with a view to locking the river Darling so as to provide for navigation up to Wilcannia. (*Appendix D 14.*)

716. In that examination did you come to the conclusion that it would be possible so to lock the Darling River that the water could be distributed over the plains? I did not give any special attention to that subject at the time. My only consideration was as to the navigation, but from what I saw of the country I think the water could be sent back in large quantities. The weirs used in the navigation could be raised to the level of the outlets, but it would be at a great expense. (*Appendix D 15.*)

717. Is the country similar to that about Gunbower? It is not like the Gunbower scheme; it is more like the country on the Goulburn or Murray Rivers. The Gunbower scheme is intersected by different creeks.

718. Are there many ana-branches of the Darling? There is a good number, but I do not know the number.

Supply from the Darling.

719. Is it your opinion that a scheme similar to those carried on on the Murray and Loddon from the waters of these rivers could be carried out from the Darling? Yes, but I think it would be more expensive, on account of the weirs requiring to be higher.

720. Did you notice whether the banks of the river were higher near the river than further up on the plains? I did not notice it, but I am pretty sure they must be, as it is the case in all rivers having periodical floods. When the river overflows the heavier particles are deposited first, so that the thicker deposit is near the banks.

Fall of the Darling.

721. What is the fall of the Darling? 3 inches in the mile.

Velocity.

722. Almost nothing? It is enough to give a good current when the river is in flood, but there are times when it would not be above half a mile an hour.

Longitudinal section of the Darling.

723. You produce a longitudinal section of the Darling River? Yes. (*Appendix D 16.*) The black line is the

the longitudinal section of the bed of the river. The blue or dotted line indicates the flood-levels as observed at different places and noted in the survey, but they evidently refer to different floods or different stages of a flood. Mr. G. Gordon, C.E. 8 Aug., 1884.

724. What length is this section? 368 miles.

725. How do you account for the indentations in the bottom? I do not know how the deep holes originated. The Murray is full of these deep holes, some of them 20 or 30 feet deep. Where there is a straight line, it indicates that there is very little variation in the bottom. Indentations in the river-bed.

726. What is the nature of the bottom? Sometimes sand and sometimes a kind of limestone—not rock, but a concretional sort of limestone or hard gravel. There is also a hard clayey substance in some places, and rock occurs in others; for instance, at Wilcannia and about 20 miles lower down. At another place lower down there is a bed rock which would be a good place for a weir if it were otherwise suitable. Nature of bottom.

727. Was the Darling very high when you went down? No; I went down in September, 1882, low-water, in a boat drawing 2 or 2½ feet of water, and the river was nowhere dry, although the boat was aground a great part of the time. Height of the river.

728. Would the weirs be very expensive which would have to be put across the river to divert any portion of the water? They would, to make them high enough to divert the water, and if the river were to be made navigable, it would increase the expense of the locking also. Cost of weirs across the Darling.

729. In constructing the weirs, what class would you construct as most serviceable? Where there was a good bed I would have a fixed weir half way across, a movable weir for the rest of the distance, with a lock built in concrete or stone at the bank of the river. System of weirs.

730. Would the same weir do for diverting the water? It would be cheaper for that purpose to have a timber weir, as we have in Victoria, but where the bottom is hard I would have a concrete weir for navigation.

731. Then you know nothing further of the Darling than you have stated? That is all I know.

732. You know nothing of the wells in that country? No.

733. You never travelled out from the river? No.

734. Do you know anything of the wells in the north-east part of Victoria? Only in a general way. I know one case where they went 460 feet deep and came on a bed of rock without water. That was in the parish of Laen. They met with very wet sand and pipeclay, and what water there was was in the sand, it was very salt, but they had no flow of water. (*Appendix D 17.*) Wells in the north-east of Victoria.

735. Do you know of any place where they had a flow of water where they came upon what was apparently old river-beds? They came upon water bearing drifts in many cases. There was one in which there was a distinct current in the bottom of the well, where it sank into drift, and it was sufficient to carry the bucket across the well, as I was informed. I did not see it. Water-bearing drifts.

736. What depth was that? Not very deep. I have no information on that point at present.

737. *Mr. Barton.*] Can you give us any idea of the average width of the Darling? It is from 180 to about 200 feet at low-water level; that is the bottom width, and the slopes are from 1½ to 1 to 3 to 1. Average width of the Darling.

738. What would be the height of the banks on an average? About 30 feet. Height of banks.

739. Then is it your opinion, considering the friable nature of the soil, that it is possible to dam that river sufficiently to irrigate the surrounding country at a cost likely to make it a commercial success? I do not think it would pay to irrigate from that river, the supply being so uncertain, but it may do very well to supply the back country for stock watering. Possibility of damming the Darling for irrigation purposes.

740. Not for irrigating? No. The diagrams of Mr. Russell show that the river flows only two months in some years. The quantity brought down in these two months is so small that it would require a very great expenditure to store and distribute it. The Darling is quite different from the Murray and Murrumbidgee which are extremely regular.

741. You do not know anything about the river above Wilcannia? No, I have not been higher up.

742. *Mr. Donkin.*] If the river were locked at Wilcannia for navigation, to what height do you think it would bring the permanent water? I think to a height of 6 feet above summer level. Probable effects at Wilcannia by locking the river.

743. Do you not think a greater depth could be obtained? It would be much more expensive.

744. But it would give a greater supply for the back country? What was taken would have to be in flood-time. It would increase the cost of navigation if locks were made high enough to throw the water into the back country, or it could be done by one of the movable timber weirs without a lock.

745. Do you think it possible to lock the Darling permanently to a height of above 6 feet, so that a larger body of water would be available to distribute over the back country by means of off-takes or channels? I think it would be more advisable to keep the navigation locks at the 6-feet level and put in special weirs to divert the water into the back country. There would have to be a great many locks for navigation where there would be no chance of sending the water into the back country, and it would be a useless expenditure to make them all of that height. It is quite possible that it might be cheaper to put in some places higher locks for diverting the water, keeping to the 6-feet height for navigation.

746. Would a weir of wooden construction stand? Yes I am sure it would. Wooden weir.

747. *President.*] If a navigation scheme for the Darling were agreed to, would it be possible to combine with it the distribution of water? Yes, keeping them to a certain extent distinct. I think there would have to be special works for navigation and special works for irrigation. Navigation with irrigation scheme combined.

748. Would the weirs serve both purposes? In some cases they might possibly be made to do so.

749. So that you would have to use extra weirs? Yes. The extra expense would be in the locks, and that could be got rid of partly, in some cases, by cuttings through the narrow necks that separate two points.

750. *Mr. Donkin.*] In any case there would be a very great waste of flood-water? Yes, I do not think there would be space with lakes to impound it, but the effect of locking the Darling would be to impound a considerable quantity of water. Waste of flood-water.

751. *Mr. Murray.*] Did you find the banks of the Darling much higher than the back country? I have not travelled across or taken levels.

752. Would it be possible by cutting a canal through the bank to divert the water into the ana-branches? No, the ana-branches seem to have their beds half-way up the bank, and I should think they rise several feet after that. They are flood outlets. Ana-branches.

753. *Mr. Townsend.*] Do you think there would be any great expense in securing the wings of the weirs against the action of floods? I think not, if you selected a good site. Securing the wings of the weirs.

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754. Did you examine the rocky part of the channel below Wilcannia? Yes.

755. What rock is it? I could not make out what it was—it was very hard.

Navigation: probable passenger traffic and freight.

756. *Mr. Gipps.*] Suppose the Darling could be made navigable, what would be the value of the passenger traffic and freight, and what percentage would they return on cost of works? I think I made out that the return would be about 10 per cent., but I have not my report by me to refer to. It was my opinion that it would not pay an outside Company to take it up at present, but would pay the people who were proprietors of land and otherwise interested in that part of the country.

Returns from navigation and irrigation.

757. As a general question, considering the annual charge upon the outlay, do you think it would be better applied to navigation than to irrigation? I am not prepared to say. I don't think it would be wise to spend large amounts in making provision for irrigation.

758. Suppose that in the upper part of the river sufficient water were preserved for a regular supply? I do not think it would be remunerative. The cheapest storage we could make is that at Warang; but that required a very expensive channel from the river to fill it, because it is not on the river.

759. *Mr. Donkin.*] What price was the cheapest? £17 5s. 11d. per million cubic feet.

Quantity of water for each lock.

760. *Mr. Gipps.*] What quantity of water do you consider it necessary to provide for each lock? I am not certain. I do not like to answer such questions from memory. Generally the locks are 6 feet lift, some 8, some 5½; they differ in lift.

761. You did not calculate the exact quantity of water for each lock? Yes; I took an average, but I do not come prepared with it.

762. It would be a considerable quantity? Yes.

763. The higher the weirs the less would be the quantity of water required to lock? Yes, because there would be fewer locks. On the other hand, the displacement of the vessel in the smaller lock would have a greater ratio to the contents of the lock.

Hydraulic power.

764. Have you applied power to any of these Victorian schemes? At Malmesbury there has been put up a turbine, and the person who put it up was allowed to work it as long as there was surplus water.

765. *Mr. Barton.*] For what purpose did he use the turbine? For sawing bluestone.

766. *Mr. Gipps.*] What horse power did he use? I do not know; it was about 3 feet culvert for the water and about 10 feet fall.

Position of locks.

767. *Mr. Donkin.*] On account of the Darling being a very tortuous river, would that be a disadvantage? You would have to choose a place for the locks, so as to enable a vessel to have a free course in and out.

768. From Wentworth to Wilcannia would the tortuosity give about double its length in a straight line? About two and a half times, speaking from memory.

769. *Mr. Gipps.*] In the treatment of the Darling, which do you think it would be most beneficial to provide for navigation or irrigation? For navigation, I think. You would never get thorough irrigation there; I do not think there is water enough in most years.

770. The lowest average I think is 170 cubic feet per second according to present records? You cannot take the average to be of any use.

Waranga basin.

771. *Mr. Donkin.*] What depth is the Waranga basin? About 6 or 8 feet. But that is not one of the ordinary marshes that occur in the Colonies; it is a very singular depression, more like Lake Charm.

Lakes.

772. Most of the inland lakes in New South Wales are simply swamps? I believe so. Those in Victoria are generally below the level, and could not be used for storage reservoirs.

773. *Mr. Townsend.*] In the case of two neighbouring lakes, is not Lake Camperdown considerably above the other? The lakes are at Basin Banks, near Camperdown. I think the difference of level is about 100 feet.

774. And one is salt and the other fresh? Yes; one salt and the other brackish, and there is fresh water between them.

Purpose of locking the Darling.

775. You say you do not think it would be a commercial success to lock the Darling for irrigation, but you think it would be for the distribution of water? I think so.

776. Do you think the bank would hold there for weirs? There are plenty of good places more favourable than those found on the Avoca.

Depth required for navigation.

777. *Mr. Gipps.*] What depth of water would be required to keep up navigation throughout the year? A minimum of 6 feet at the upper end of the pond. It would be just 6 feet on the lower sill. It would be level to the next lock, and there may be places between them 30 feet deep.

Distance between locks.

778. *Mr. Donkin.*] What number of miles apart would the locks be? They would average 25 miles apart.

779. In your visit to the Darling did you go simply to the river and back again? I went from Hay to Wilcannia, and came down the river to Wentworth.

Watercourses between Hay and Wilcannia.

780. From Hay to Wilcannia you crossed no watercourses whatever? Yes, I think we crossed some watercourse.

Catchment area.

781. Did you notice any catchment area from Hay to the Darling? No, I did not. There is no catchment there.

782. In your opinion the Darling is not fed by the rainfall on the surrounding country? No, I believe it is not.

783. Could the water from the Darling be diverted so as to supply the stock of the country to the south-east of Wilcannia? I think probably it could.

Increase of value of land through irrigation.

784. *Mr. Gipps.*] To what extent does irrigation in Victoria increase the value of the land? There has not been sufficient time to ascertain what increase of value it confers, but land would very soon be raised to three times its previous value.

785. You were connected with the Madras water-works? Yes; the undertaking of the Company with which I was connected was transferred to the Government.

786. *Mr. M'Mordie.*] It was one of the most successful schemes in India financially? No, the Godavery is the most successful one, and the Cavery is a good one.

Diversion of water from Toongabuddra.

787. What works were carried on by the Company with which you were connected? The diversion of the water from the Toongabuddra down the valley of the Kondana to the Penwar.

788. How was the water elevated from the river—by a weir? By a weir, including a small island in the river; the weir was a mile long. Then there was a channel or cutting for 3 miles, 250 feet wide, and about 8 feet deep. Then it came out on the slope, and was carried along that for 60 or 70 miles, giving off irrigation-channels as it went on.

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789. Was it not found practicable there to build masonry dams on sandy beds? It is quite common. On the Penwar we built a dam on a sandy bed on brick wells of about 6 or 8 feet depth, but the weir on the Toongabeddra was built on the rock.

Cost.

790. Do you remember the cost of the irrigation works per acre of the land irrigated? No, I cannot. The land included in the scheme was, I think, 400,000 acres, and the cost was £1,000,000. It was purchased by the Government about two years ago.

791. At that cost it was expected that the financial results would be satisfactory and pay for the outlay? Yes, they would have been.

Tank irrigation at Madras.

792. About the tank irrigation at Madras, can you give us any information? The irrigation below most of the tanks is limited in extent, considering the quantity of land taken up by the tank itself. There is sometimes a less area cultivated than that of the tank itself.

Cost of labour in India and in Victoria.

793. *Mr. Murray.*] It would be difficult to compare our system with the Indian system, on account of the greater cost of labour in this country? Yes. I have taken out the cost of one of the latest Indian schemes and reduced it to the Victorian cost.

794. The cost of dams I suppose is about four times as much in Victoria as in India? About five to one. In India the excavation of earthworks is 2d. a yard or less.

795. The irrigation is applied mostly to rice-growing? Yes, and sorghum and other crops in some districts.

796. *Mr. Townsend.*] Is there a large amount of wheat grown? Not in Madras, but in other parts there is.

797. *Mr. M'Mordie.*] There are some large tanks in Madras that irrigate large areas as compared with their own area? Some of the higher tanks do, but the larger number are small shallow tanks, on the east coast especially, and also in Mysore. Every drop of water falling on the east coast is stopped and utilized for irrigation. They would sacrifice one-half the land to irrigate the other half.

Country near Wilcannia.

798. *Mr. Donkin.*] In your journey from Victoria to Wilcannia were you impressed with the richness of the land on this side as compared with that in Victoria? No; Wilcannia is a barren-looking place; there is a good deal of sand there.

799. The Colony of Victoria as a whole is better fitted for agriculture, the land is richer—at least there is more of it fitted for cultivation, the rainfall greater, and I should like to know whether in your opinion you think irrigation will be a financial success? I think so; I think it can be carried out at £5 or £6 an acre for the original cost of the works, and it will pay at that.

800. *Mr. Barton.*] That is, 5s. or 6s. per acre per annum? A few extra bushels per acre per annum would pay that.

Advisableness of irrigating country of the Darling.

801. *Mr. Donkin.*] Do you think it would pay to irrigate the country on the banks of the Darling if it could be irrigated at an expense of £5 or £6 per acre? I think it would if done in small patches near stations to feed stock, if it could be done at that price; but to irrigate pasture requires much more water, and would cost more than I have stated.

802. Did you remark the Lachlan River at Booligal? No, we reached there at night. It is not very deep there.

803. You did not go above Wilcannia, and do not know the river system at the heads of the Darling? No, I never saw the country.

Catchment area of the Darling. Evaporation.

804. There is a very large catchment area, but the country is level, and a large quantity of the water never reaches the Darling? So I believe; that is the case with many rivers in Victoria. The water after heavy rains is left in shallow pools and sinks into the ground a few inches only in some places, and is evaporated.

Both means of water conservation.

805. *Mr. Gipps.*] What course would you suggest to the Commission in order to arrive at the best means of conserving water, or developing a plan for that purpose, from the heads of the different rivers? I think I should have the river systems examined, not surveyed, to ascertain the probable feasibility of diverting water into storage tanks for whatever purpose it was intended to use it. Some flying surveys could be made to see how far the diverted water could be carried, taking each river system separately. That is the way we did it in Victoria, and it answered very well, although I do not say that it would do equally well here. I think a good deal of water could be intercepted to carry to the westward.

806. *Mr. Donkin.*] The whole country is nearly level, with a fall of scarcely a foot to the mile, and there would be a difficulty in carrying out any plan by gravitation? You can do a great deal with 1 foot in a mile. Our rivers at the mouth generally have only about 3 inches. If you get depth you can get a good current at 6 inches in the mile.

Size of tanks in Victoria.

807. What is the size of the tanks used in Victoria for conserving and confining water? The largest, the Yan Yean, covers about 1,300 acres, and that at Malmesbury is of about the same extent but deeper. (*Appendix D 18.*)

Quantity of water per acre and per annum for irrigation.

808. It is something like that scheme for storage that you recommend for adoption here? Storage for irrigation must be on a large scale, but at the same cost as these works it would hardly pay. Taking different kinds of irrigation, it takes about 75,000 cubic feet of water to the acre per annum, or at the average cost about £20 per acre, according to the cost of the Victorian storages.

809. That is allowing for loss by evaporation? And the difference in the kinds of crops.

Traces of old river beds.

810. You had no survey in Victoria to trace out any of the old river beds underground? No; borings for water were made by the Mines Department, but I do not know anything about the results, and I do not think they are yet published.

811. *Mr. Murray.*] I suppose there are a number of local Boards in each system in Victoria? Sometimes a Shire has a Trust to itself, sometimes two or three Shires have one Trust, each sending one or more representatives to the Trust Board, and one member is appointed by the Government to the Board.

Size of shires in Victoria.

812. What is a convenient size for a Shire? There are all sizes in Victoria. Swan Hill is the largest in that part of Victoria.

Irrigation of country from Tocumwah to the Wakool River.

813. If a water scheme can be so well supplied there, could it not be better applied to the Edwards River and the country round Deniliquin? That district is in New South Wales. From near Tocumwah to the Wakool River a large extent of country could be irrigated by gravitation, and the water could be taken off the Murray at a trifling cost. The Murray rises there about 13 or 14 feet, as against 35 feet at Echuca, and I think the valley of the Edwards, and the Wakool, admirably suited to an irrigation scheme.

814. *Mr. Donkin.*] You have heard of the Yanko cutting? No.

Quantity of rainfall flowing off the surface.

815. *President.*] Has anything been done in Victoria to find out in hilly country the permeability of the rock? I gauged it at Sandhurst, and the quantity of water flowing off the surface was one-sixth of the rainfall which fell on it. That was on rocky ground on the gold-field.

816.

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816. Would the rest get away through the strata, or be absorbed principally by evaporation? It must get away; it flows quickly off the ground. It does not lie about in pools there, so that very little was lost by evaporation, it was mostly absorbed.

Soakage. Water losing itself through the bed of the rivers. Avoca.

817. You never applied any test to the rivers to find out whether the water gets away in the beds? We know without making special observations that this is the case with the Avoca. The comparative smallness of the river lower down makes it apparent. It cannot get away except through the bottom, which is quite loose.

818. *Mr. Townsend.*] Has any attempt been made to determine the age of the gravel in the Avoca—the series of drifts to which it belongs? I do not know.

THURSDAY 14 *AUGUST*, 1884.

Present:—

MR. BARTON, M.P.,	MR. MURRAY, M.P.,
MR. FRANKLIN, C.E.,	MR. M'MORDIE, C.E.,
MR. GIPPS, C.E.,	MR. TOWNSEND.

F. A. FRANKLIN, ESQ., C.E., IN THE CHAIR.

Henry Chamberlaine Russell, B.A., called in and further examined:—

H.C. Russell, B.A. 14 Aug., 1884.

819. *Chairman.*] There were some matters I believe, Mr. Russell, in reference to which the Commissioners wished to re-examine you? Something was said with reference to my further examination upon the subject of wells.

Wells.

820. Can you give us any further information in reference to that subject? I have obtained some information, and I have endeavoured to arrange it in a form convenient for reference by the Commission. I am afraid, however, that what I have been able to do is not sufficiently complete and systematic to serve the purpose of the Commission. The plan I have adopted has been to mark on the map which I produce (*Appendix D 1*) the position of the wells as to which I have information, together with the depth at which water was obtained. In cases where only salt water has been obtained I have written "Salt" against the number of the well on the map. The Commission will observe that nearly all the wells are clustered about

Well on the Wee Wattah Station.

the north-west portion of the Colony. The well marked No. 1 is on the Wee Wattah Station belonging to Messrs. Officer & Co. It is about 18 miles north of the Darling, and 80 miles from Wilcannia. Good water was found at a depth of 142 feet. The temperature of the water was 82°, and the supply was at the rate of 50 gallons per minute until the bore choked with sand.

821. *Mr. Gipps.*] Through what strata did the bore pass? I have been able to obtain that detail only in a very few cases. Five bores were put down in the Wee Wattah Station in the vicinity of an old mud-spring; water was obtained at depths varying from 134 to 142 feet, but all the bores were finally choked up by drift. The well marked No. 3 is on the *Gualla Station, about 60 miles from Wilcannia. I do not know the exact locality. Water was obtained by an artesian bore.

822. *Mr. Murray.*] Is the well near Cobar? I do not know. The well was reported by Mr. Gilliat.

Well near mud-spring.

823. *Chairman.*] What is the well which is marked No. 4 on the map? That is a well sunk on the Wee Wattah run, near a mud-spring. No. 5 is at a place called Mullyer, 14 miles north-east of Wee Wattah, and 24 miles back from the Darling. Four bores were put down close to an old spring. In one bore water was obtained at a depth of 49 feet. The supply was at the rate of 12 gallons per minute, and the temperature was 63°.

824. *Mr. Townsend.*] Have you any information as to what height the water rose? In some cases. For

Inexhaustible supply at Gnalta. Medlow well.

instance, on the Gnalta run water was found at a depth of 272 feet, and it rose to within 100 feet of the surface. The supply of water appears to be inexhaustible. At Medlow well—a native well,—near Farina, South Australia, water was found at a depth of 12 feet; at 17 feet there was a sand-drift. The supply was equal to 36 gallons per hour. At Goonery Station water was found at a depth of 122 feet, and the supply

Well at Goonery Station.

was at the rate of 1,000 gallons per hour. Near Goonery, about 51 miles west of Bourke, abundant water was found at 61 feet; it rose to within 21 feet of the surface. At 69 feet another supply was found; that rose to within 3 feet of the surface. At that point a great quantity of sand came up with the water.

Fossil bones.

At 34 feet in this well large quantities of fossil bones were found, and some very large teeth, &c., belonging to some extinct animal. There is on the same station another well giving a supply equal to 65 gallons per hour, water having been obtained at 76 feet. On the well being sunk 6 feet more through some granite

Water at Bingera. Water at Tolarno.

boulders the supply was increased to 1,000 gallons per hour. Water has been found at Bingera at a depth of 75 feet, and the water rose 6 feet in an hour and a half. At Tolarno, which is south of Wilcannia on the Darling, salt water is generally found at a depth of about 93 feet. On one occasion they had to sink to 135 feet before the water was found. The bore went through a sanddrift which was perfectly dry, the sand being as fine as flour. They got nothing but salt water. I have heard that a well has been sunk since, in which fresh water has been obtained, but by going through the salt; I have not particulars of it. Then

Dunlop Station.

on Dunlop Station a strong supply of fresh water, rising to within 90 feet of the surface, was obtained at a depth of 488 feet. That well is marked No. 13 on the map. I have also to report on a well at

Well at Mount Browne.

Mount Browne. That well is also marked on the map. All that I can ascertain about it is that it supplies sufficient water to keep an engine going night and day, and to water some 18,000 sheep. The supply of water is apparently inexhaustible. There is another well on Dunlop Station yielding an abundance

Rise of water on Dunlop Station.

of water at a depth of 573 feet. The water rose to within about 15 feet of the surface. The shaft for a depth of 300 feet is 6 feet × 3 feet, and it is then continued by a water auger. At 240 feet petrified wood, water-worn pebbles, dead fish, and marine shells were found. At 300 feet a tree 18 inches in diameter was

Fossils.

found; at 443 feet another tree was found; and at 500 feet, fossils. At 550 feet there were 5 feet of sand-

Sandstone rock.

stone rock. When the water was struck the auger dropped 2 inches into fine sand-drift. This well is 20 miles west of Mount Wilson, and is 80 miles west of Bourke. 825.

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*NOTE (*on revision*):—The name of this Station, Gualla, though copied from a newspaper report is, I have little doubt, wrongly written, and should be Gnalta, in which case it would be the same as No. 27. No. 3 may be made from the following well record found since I gave my evidence:—"No. 3. Mr. Gaden had a well sunk on the Marra Creek, 15 miles back from the Darling, and at 100 feet got an abundant supply of water that seemed good enough for sheep, but when young sheep were sent to it most of them died in a few days, and the rest had to be removed."

H.C. Russell, B.A.

14 Aug., 1884.

825. *Mr. Townsend.*] What would be the height above the sea-level about there—from 350 to 370 feet I suppose? Yes.

Height above sea level.

826. *Mr. Murray.*] What borer was used? A tiffin borer, I believe. At Girilambone an abundant supply of fresh water was found at a depth of 155 feet. It rose 22 feet 6 inches in the bore. That well is marked No. 16 on the map. The well marked No. 17 is 11 miles from Forbes. An abundant supply of fresh water was found there at a depth of 136 feet. It is about 7 miles from the edge of the river, on the border of a large plain, and white sand rushed up with the water. There was a rise of 76 feet of water in a few minutes. Salt water was found at a depth of 100 feet, and fresh water 36 feet deeper. I have information of another well on St. Ann's, at Cooper's Creek, where water was found at a depth of 60 feet. In the case of another well in the same locality water was found at a depth of 90 feet. These wells are 320 miles north of Wilcannia. On the Urisino block water was found at 430 feet; it rose to within 100 feet of the surface. A whim was kept going for twenty-four hours, but made no effect whatever in the height of the water. Before reaching the water a limestone rock with fossils was met with. I do not know what the fossils were. The well is 150 miles north of Wilcannia. In Victoria, on the Avon Plains, water was found at a depth of 28 feet, giving a supply of 200 gallons per hour. I have particulars of another important well outside of the Colony—at Tarkanina, which is 60 miles north of Farina, in South Australia. Water was found at a depth of 1,220 feet—that is, 1,100 feet below the sea-level. It is good, and it rose 20 feet above the surface. Salt water was found at 800 feet.

Well supply at Girilambone.

Well on St. Ann's.

Water on the Urisino block.

Limestone rock and fossils.

Water in Avon Plains (Victoria).

Well at Tarkanina (S. Aust.)

827. *Mr. Gipps.*] Were you able to obtain the strata? No, I have been unable to do so. I am aware that it is very important for your purpose that that information should be obtained, but in many of these cases it is quite impossible to ascertain it.

828. Do you know whether the supply of water in all of these wells has been permanent? I have not that information. I have some information with reference to the wells on the Kallora Run, of which Mr. Brown is the manager. The owners of the station, I think, are Messrs. Officer & Co. One or two wells have been sunk, and water has been obtained. I have had some correspondence with Mr. Brown upon the subject, and he has now and again mentioned these wells to me. I believe, however, that the Commission could obtain from him a more connected account than I can give. I would also suggest to the Commission that Mr. Gilliat, Inspector of Tanks, may be able to give them some important information with reference to wells. The well marked on the map No. 23 is at Walgett. Salt water is found at a depth of about 100 feet; it is only 50 yards from the river. A great number of wells have been put down in that part of the country, that is about 4 or 5 miles distant, with similar results—salt water has been invariably found. I think that more recently, however, fresh water has been obtained in the district. There is a sort of fine drift sand, something like that at Wilcannia.

Permanency of supply.

Well at Walgett.

Fine drift sand.

829. *Chairman.*] Have you the depth in all those cases in which salt water was obtained? In many of them—not in all.

Salt water.

830. I ask because in many cases salt water has been found in the Riverina plains; it has been shut out, and fresh water has been found underneath it? That is the case in the deep wells of which I have given you particulars. In South Australia they have found salt water at a depth of 800 feet; it was shut out, and they afterwards found a good supply of fresh water.

Salt water at a depth of 800 feet.

831. *Mr. Townsend.*] What we want to know is the elevation of the land above the sea-level? The only clue to that in the far west is the level of the river. The railway levels have run out to a certain point, but it was from the river level that I obtained the height at Bourke. I do not know that there is anything west of Bourke from which you can obtain the height of the land. In Gippsland in Victoria a well was sunk 62 feet, and the water rose within 10 feet of the surface.

Elevation of land above sea-level.

Well in Gippsland.

832. *Mr. Townsend.*] That is at Sale, is it not? That is one of the wells at Sale. In the case of the second well there the water was found at 231 feet. It is an overflowing artesian well, bringing up dead leaves, decayed wood, nodules of iron, &c. I think I mentioned it when I was last giving evidence before the Commission. The well marked 26 is at Zaen. Several heavy streams of water were cut, the bore going down 400 feet. A tree and some plum-stones were found at a depth of 250 feet from the surface. A drift was found 150 feet deeper, or 400 feet from the surface. That well is in the Wimmera district, between Wentworth and the sea.

Well in Wimmera district.

833. *Chairman.*] You have no information as to how the supply of water from the well has been kept up? I believe it still supplies the town with the demand made upon it. I do not know what the demand is. The well marked No. 27 is at Gnalta. The water was found at a depth of 127 feet, and it rose 50 feet in the well.

834. *Mr. Barton.*] Is the well at Girilambone a Government well? Yes, the water was found there in April, 1883. The man in charge of the auger said he would not go an inch deeper until he received orders from the Government. I have a memorandum of five wells sunk near Girilambone. They all found salt water, and when they got a stream of fresh water at Girilambone they stopped. This is why the man to whom I have referred said he would stop when he reached fresh water. At Parkes there is a well, at which water was found from 40 to 50 feet from the surface. The supply is described to me as a perfect sea of fresh water. In the same neighbourhood a well has been sunk with similar results. The well to which I refer is 10 miles south of the river. At Ardennes in the Wilcannia district, water has been found at 300 feet from the surface. It is of first-class quality. At Gilgoin, 16 miles from the Darling, water was found in a bog 28 feet from the surface. It was clear and on a sandy bottom. It rose to the surface, and was piped to troughs. The bog is called Cuddy's Spring. Two whole skeletons of large animals were cut and fossil teeth were dug up when the well was being sunk. At Collana, 450 miles from Adelaide, a splendid artesian well has been struck on Mr. Dutton's run, in a south-easterly direction from Lake Eyre. This was in July, 1879. At the Depôt Glen the well marked 32 on the map will be found. Water was discovered at 55 feet from the surface, and rose 6 feet in the shaft, and required horse power to keep it down, to enable the men to go on working. This is in the Albert district. On the Boorara or Boora run water was found at 40 feet in fine sand. It brought up with it many fine pieces of charcoal. The well marked No. 34 is a little north of Walgett. Fresh water was found in fine sand, at a depth of 80 feet. In this part of the country it seems uncertain how far they sink for fresh water when you have found salt. There is a valuable well in South Australia, St. Stephenson, 274 miles north of Adelaide. Water was found at a depth of 205 feet. The supply is decribed to me as a fine spring of fresh water. The Commission will notice a well at Brindingabba. It is near Hungerford, at the Paroo, 121 miles from Bourke, and 3 miles south of the Queensland border. Here two wells were sunk

Wells near Girilambone.

Well at Parkes.

Water at Ardennes.

Water at Gilgoin.

Artesian well at Collana.

Water in Albert district.

Water on the Boora run.

Well at St. Stephenson, (S.A.)

Well at Brindingabba.

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sunk close to a dam between two hills. In the first no water was found, although it was sunk 130 feet; in the second water was found at 125 feet; the supply is very abundant, and rises to within 43 feet of the surface. When sinking this well, shells and lignite were found at 120 feet from the surface. I think the Commission will find great difficulty in obtaining the information they require with reference to some of these wells—people will not give it to you. A friend of mine at Hay endeavoured to obtain some detailed information for me, but as soon as it became known that it would be published, the persons to whom he applied refused to give it to him—they did not wish the information published.

835. *Mr. Murray.*] I suppose they are afraid of free selectors? I suppose so. It seems to me that the information I am able to give the Commission is very imperfect. Of course you want the sea-levels. You can get these from the Macquarie to the Bogan and Bourke from the railway levels.

Source of water in different wells.

836. *Mr. Townsend.*] Can you give us any information as to whether the water struck to the east of the Barrier Range is the same as that struck to the westward? No. As a rule there is no careful test of the water which is found. I have not heard of any analysis being made in South Australia, and it would be impossible to tell whether the water was the same.

837. But if you have a series of wells coming from and going to the Barrier Range, would not the depth of the water be a guide to you? In looking at the subject myself I have been very much fogged. You find in one place an abundant supply of water at a depth of 100 or 200 feet, and within a few miles you get a supply at a depth of 400 feet. That is evidently a different supply. The impression left on my mind from what I know of the subject is that a great many of the wells have been found in old river-beds. On the Goonery run, for instance, a moderate supply of water was obtained at a depth of 76 feet. The bore was taken through granite boulders 6 feet deeper, which certainly do not grow there, and a supply at a rate of 1,000 gallons an hour was obtained. A few miles from this, in another well, a tree was found at 300 feet from the surface, and an abundance of water at 443 feet. For a long time past I have felt that what was required was a map showing where the wells are, and the depth at which the water was obtained. I have thought on the subject for some time, but I have found that I could not get the information necessary to enable me to carry out my plan. The well marked No. 38 is at Winchelsea, in Victoria. Water was found at a depth of 488 feet; it is an artesian well, and the supply is equivalent to 300 to 400 gallons per hour. Well No. 39 is in the mallee scrub in South Australia. It goes to a depth of 112 feet. The Mulga gives a supply of 2,000 gallons per hour, and it is obtained below loose drift. This well is on country adjoining Cuthawarro Station, about 31° 55′ latitude, and 141° 50′ east longitude; at first it gave only 800 gallons per hour, but after two attempts the well was sunk below the loose drift, and the supply rose at once to 2,000 gallons per hour. Well No. 42 is near Bourke. Water was struck at 192 feet from the surface. You will see near that another well in which water was found at 61 feet. It is splendid fresh water, and it rose 40 feet in the bore-hole. I have not entered well No. 44 on the map. It does not bear very much on the question, except for the fact that Mr. Hall had a well upon the mountain, and one at Darrbrook, in which the water rose and fell simultaneously. I wrote for particulars, but did not get them. I now come to the wells to which I have referred as having been sunk by the contractors for the Nyngan and Bourke railway line. In one case, a bore was put down 76 feet, and salt water was obtained. They sunk to 121 feet, but no more water was found. The bore passed through quartz ore and hard clay. In the case of another bore sunk by the contractor, water was found at 76 feet, but it was also salt. The bore was continued to 250 feet, but no more water was found. In this case the bore passed through clay and sand. On the same railway line, a well was sunk 115 feet to salt water. The well was continued to 135 feet, but no more water was found. In another case on this line, a bore was sunk 70 feet, when salt water was found; at 142 feet, more salt water was found. The water rose 50 feet, when the work was abandoned. Water from the well is now being condensed. Another well was sunk to 150 feet, and no water of any kind was obtained. At a place called Snowtown, in South Australia, water was found at 166 feet. It rushed up 16 feet above the surface, bringing at first about a ton of sand. It yielded 200 gallons per hour of good water. At Cobar water was found at 627 feet, giving a supply of about 300 gallons a day. The well marked No. 52 is at Greenhills, on the Barcoo. Water is found in abundance in this locality, in wells about 90 feet deep, and the water is described to me as being as soft as rain-water. Not far from this point, on Darr River Downs, water is found at 80 feet. Mr. Marr, in a well at Narramine on the Macquarie, found petrified myall at a depth of 180 feet. Well No. 54 is on the Nondaro run; good water was found at a depth of 140 feet. The well is about half-way between Poolamba and Wonaminta. A number of wells have been sunk on Liverpool Plains; they average from 40 to 70 feet in depth, and water has been found in an old river drift. I have had special information with reference to the Wandoola, Liverpool Plains, well; that is the second well. Water was found in it at a depth of 159 feet. The first 100 feet of sinking was through red soil containing layers of gravel with fossil bones and teeth. Another well was sunk 60 feet deep on the same run; it has continued to overflow for the last fourteen or fifteen years. I do not know whether I mentioned, in connection with the wells at Dunlop's station, in which the water rose to within 10 feet of the surface, that at a depth of 300 feet a tree was found 18 inches in diameter, being in a horizontal position, with the branches to the west and the roots to the east. The tree was petrified, but it appeared to be like the trees which are now growing on the surface. 143 feet lower, another tree was found. Near Silverton water has been found at 240 feet from the surface. The water rose 72 feet in the well. I feel that the information which I have been able to obtain with reference to these wells is exceedingly imperfect. I have not the means to make a statement as comprehensive as I should like to make it. I have no information as to Riverina, but I know that water has been found there in many wells.

Well in the mallee scrub (S.A.)

Wells on the Nyngan to Bourke railway line.

Quartz and hard clay.

Water at Snowtown, (S.A.)

Water at Cobar.

Water on the Barcoo.

Petrified myall.

Red soil, layers of gravel containing fossils.

Tree at Dunlop Station 300 feet under surface.

Water near Silverton.

Number of Government wells.

838. *Chairman.*] How many of the wells you have named would be Government wells? Only about half a dozen of them. There is a well-sinker in the Riverina district who can give you some general information with reference to water found in that locality.

Difficulty in obtaining information.

839. *Mr. Murray.*] Do you not think that the altered condition of the land law will induce lessees to give more detailed information than they now appear willing to give with reference to the supply of water on their runs? I dare say that in many cases they would be induced to do so, but once a prejudice has been established it is hard to overcome it. Mr. Abbott collected a great deal of information with reference to the Liverpool Plains district, at my request, but he informed me that he had the greatest difficulty in obtaining what he wanted. In many cases particulars of wells were refused when he asked for them, and he was obliged to obtain it by riding about the district and making his own observations. There are one or two matters which have come to my knowledge since I was last examined, and which I

should

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should like to mention to the Board. Mr. W. E. Abbott informs me that in September, 1880, he visited Dubbo, and the river was running 15 feet deep, and at a rate by careful estimation of from 4 to 5 miles per hour. The flood gradually fell, and at the end of three weeks he saw it again still running 4 feet deep and at the rate of 3 to 4 miles per hour. This water never reached the Darling, in fact scarcely reached the marshes or about 250 miles; yet if we take the least estimated velocity, 3 miles per hour, the water travelled past Dubbo 72 miles per day, or 1,440 miles in the twenty days. That is about enough to reach Wilcannia, and it only travelled 250 miles, or the distance it should have passed over in three and a half days. The average depth was 9 feet 6 inches passing Dubbo, and six times as much passed Dubbo as was found in the river lower down, so that in fact nearly all the water soaked away into the gravel beds in the Macquarie River. At the end of June, 1884, for three weeks the water ran past Dubbo with an average depth of 2 feet 6 inches, and a velocity of about 2 miles per hour. This water took three weeks to reach Gin Gin, 40 miles from Dubbo in a direct line. At 2 miles per hour it would go in a day 48 miles, and in three weeks or twenty-one days, 1,008 miles. This quantity of water therefore passed Dubbo. Now, even if the river course measures 96 miles from Dubbo to Gin Gin the water should have reached there in two days, but it took twenty-one days, so that ten times as much water passed Dubbo as reached Gin Gin. This gives some idea of the enormous quantity of water which gets away through the gravel beds in the river. I mentioned to the Commission before that, although the river was apparently dry at many places near Dubbo in March of this year, there was a current in the river-bed passing through the gravel. The deposit of gravel in the river now is enormous. 40 feet from the surface it extends all over the flats, and contains water. At the bridge trees were found in the old bed 85 feet below the present river-bed. These and other facts show that the deposit has been in progress for countless ages. There seems to me to be conclusive evidence that the water gets away in the Macquarie and other rivers by means of these old drifts, which act as drains to carry away the water, and so effectively that in a recent fresh lasting three weeks, five-sixths of the water ran underground at once. A gentleman who has resided at Dubbo for many years tells me it is a well-known fact that the river being low it required a very heavy rainfall before the water would run down the river.

Flood of Macquarie observed by Mr. W. E. Abbott in 1880.

Observations in 1884.

Depth of gravel in Macquarie river-bed.

840. *Chairman.*] Do you think it would be possible from local inquiries to discover the point at which this soakage commences? I doubt it. It would appear that the gravel extends right under the rivers, and in some cases under the flat lands, as in the flats about Dubbo and other places. The bed of the Castlereagh is at present about half filled up with river drift. There is a place parallel to it which I have already mentioned; it is called the "Monkey," and it is evidently an old bed of the river filled up with drift, and water can always be found in it at a comparatively shallow depth.

Extent of the gravel deposit.

841. *Mr. Murray.*] Are there any stations there for the observation of the river? There are none higher up than the point of navigation.

842. *Chairman.*] In India, where the rivers are wide and shallow, and where they are filled to an enormous depth with sand—the Ganges and the Jumna for instance—they succeed in diverting the water in enormous volumes to a safe holding-place behind the weir: we thought that if we could obtain the requisite information with reference to the Darling country, it would be well to intercept the water at certain points and divert it into the river again at a point where we know the bed to be solid? It would, I think, be requisite to make surveys and to have borings made to get that information.

843. *Mr. Gipps.*] Most of the rivers have rocky bars running across them? That is so in the case of the Darling.

Rocky bars in Darling and tributaries.

844. And almost all its tributaries? Yes; I know there are such rocky bars in the rivers. I was about to say that on the Coomoo Station, somewhere about the head of the Peel River, a great many little creeks run out of the hills and disappear into the ground as soon as they reach flat land. The same thing takes place in many parts of that country. I referred before to a communication which I received on this subject. I now produce it for the information of the Commission. (*Appendix E 2.*) It will be observed that the writer refers to the number of cases in which the same state of things may be found.

Creeks at the head of Peel River.

845. *Chairman.*] Has it been an established rule to register these flood-marks? I do not know whether it has; I think not. There was nothing of the sort at Dubbo when I made inquiries in March this year, but I have since learned that Mr. Samuels has made some records on the trees.

846. How many established registers have we in the Colony for the observation of the height of the floods, or ordinary river-levels? There are four on the Murray and three on the Murrumbidgee, and five on the Darling from Wentworth to Bourke.

River gauges in the Colony.

847. Do you not think it would be a great advantage to have established at all towns on the rivers these places for observation? They would give a very valuable record. I tis difficult to say, however, where it would be best to endeavour to obtain the information, unless you had surveys, or found some one who knew the localities.

848. From what Department do you obtain the most reliable information on this point? I think all the gauges have been established by Mr. Moriarty. I sent to Bourke the other day to ascertain whether there were any river records of past years, and the reply I received was that there were no records prior to 1879; that is when I began to publish them. The records had been purely official, and the people in the locality had no opportunity of keeping them. I do not think there is a continuous record of any rivers prior to 1879, except the records which I have already handed to the Commission. Records, however, have been kept at Moama and at Ki.

849. Have you any simple system of gauge which could be established generally? In most places the gauge is put upon the bridge in some fixed position, with the feet and inches marked on it.

850. Have you no self-registering gauges? I have for the tides, but as regards the rivers there is a difficulty, because a river may at any time rise 30 or 40 feet. The Hawkesbury rose 50 feet in one night, without a drop of rain falling in the district. This was the first flood they had.

Self-registering gauges.

851. *Mr. Murray.*] Would it not be a good plan to appoint district or staff surveyors—where there are such officers—to keep these records, and where these officers are not to be found, the police? Yes, it would be better to have some one who is accustomed to make records. The police, like telegraph operators, are movable. You may train a man to do the work, and immediately he becomes efficient he is sent somewhere else.

Appointment of person to keep records.

852. *Chairman.*] Would not the work come more properly within the province of the Clerk of Petty Sessions? Yes, I should think so—they could keep the record very well. My own impression is that it would be well to establish at selected places on the principal branches of the Darling—say the Bogan, Macquarie, Namoi, Barwon, and other rivers—gauges, from a careful observation of which you might be able to form some idea as to where the water goes.

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853. It might perhaps be well to request the Department of Roads to fix gauges on all the bridges, to find the nearest resident and ask him whether he would keep the record? Mr. Bennett offered to have a record kept in that way along the coast rivers, but it has not been done. It would involve the putting up of gauges at all the places, and that means the expenditure of a considerable sum of money.

854. My idea is that if we obtain your advice on the subject, we might make a recommendation for these gauges to be established wherever there were important watercourses spanned by Government bridges? I think it would be an excellent idea. It is quite necessary, in fact, to have this information, to complete the study of water supply.

855. Would not that information be valuable to you? Yes, very valuable.

856. In making the requisition for such gauges, it might be well to request that the information should be sent directly to you? I do not know what the views of the Commission may be, but I suppose that it will not sit for ever, and it is desirable that this information should be furnished regularly henceforward, and if it were sent to the Observatory it could include it in the rain record every year.

Daily records of height and velocity of rivers

857. Is there any other information which would be of value to you in connection with such an establishment? I presume that the record would be a daily record, showing the time at which the water rose and fell, and the velocity of the current; if so, that would be sufficient.

858. Is there an existing arrangement whereby the Telegraph Department convey the information to you? Yes, it is sent without charge.

859. Of course it would make no difference if the quantity of information sent was slightly increased? I do not think so. Every morning the operators send down messages to ascertain whether the lines are in working order, and it is just as well that they should send this information as any other ordinary messages.

860. We have prepared a list of questions which we intend to send out to surveyors, landholders, and others. The questions will be accompanied by a circular and a skeleton map. One of the questions which we propose to ask is: "Would the impounding of flood-waters in the rivers and creeks in your district, by means of dams, and limited to the natural holding capacity of such watercourses, be prejudicial or beneficial to the interest of the general public?" There are many places in which water is so impounded at the present time.

Impounding of flood-waters in rivers and creeks

861. But in those cases it is on the holding of one person? As far as I could hear it is a common practice in many parts of rivers, especially upon the Darling. There are many cases on the lower parts of the Darling where water is conserved in that way. On one run there, there was a dry swamp which no doubt had been originally connected with the Darling. Some years ago a canal was made and it filled this swamp. It was flooded in 1870, 1875, and 1879. There has not been any water let into it since the rise of the river in 1879, but there is nevertheless water in the swamp. There are several of such instances upon the Darling River. There is an enormous natural reservoir close to Menindie, and I think you might add to your list a question to the people in that neighbourhood as to what has actually been done in this way.

Canal to fill swamp.

Natural reservoir near Menindie.

862. In the case of the canal which you have specially mentioned, I suppose the water would be drained off only at a time of inundation? Only at the time of a flood.

863. Is the fall sufficient to prevent the water from running back into the river? Every provision is made for that. The proprietors of the Tolarno Station, who made the canal, sent me down a statement of the general facts with regard to it. I would suggest that one of these circulars should be sent to the telegraph master at Menindie. I know he takes a great interest in this matter, and I think he will be able to furnish to the Commissioner some valuable information.

864. Can you suggest any other particular in reference to which it would be desirable to obtain information, or any other means by which we could obtain it? If you carry out the river records at points higher up than those which I can reach it would complete the work, so far as that particular is concerned. The number of rain records is increasing every day. I constantly receive offers from different persons to make observations, and fresh records are being sent to me. I do not think anything need be done to increase the completeness of the records in that way—they are becoming more complete every day; but it is desirable that some proper record of the rivers should be kept. I am quite sure the Commission will see from what I have said that the river records which I can obtain are quite insufficient for their purpose. As far as I can gather, you would not find one place in twenty where an exact record has been kept by private observers. The only cases which I know of are those of the record kept by Mr. Tebbutt, at Windsor, and by Mr. Gell on the Murray.

Increase of number of rain records.

Mr. Tebbutt and Mr. Gell's records.

865. *Mr. Gipps.*] Do you think that Mr. Gell's record is reliable—it appears to me to contain some remarkable inconsistencies? As far as the velocities are concerned, you must remember that the same amount of water does not always mean the same velocity. I do not know upon what Mr. Gell's calculations are founded.

Prevalent winds west of the main mountain range.

866. *Chairman.*] Have you any records of the prevalent winds in spring, summer, autumn, and winter, in the country west of the main mountain range, as to the quarter they blew from, their force or pressure at different heights above the surface of the ground, and their average pressure per diem? I have no particulars concerning the heights above the ground. We have records of the wind from many places west of the main range, but they are not taken from self-recording registers.

867. *Mr. Gipps.*] You have no self-recording stations? None but Sydney.

Value of wind records.

868. Do you not think that these observations are of great importance? I do not think the wind record would be of much value; as a rule you get very little wind in the interior.

869. I should have thought they would have been valuable in connection with the wind-power; take the town of Stockton, in California, for instance—almost all the water consumed by that town is obtained by means of windmills? That is the case almost everywhere upon the Sacramento Flat, but that is close by the sea, and therefore a windy place.

870. *Chairman.*] Does the direction of the wind seem to influence the humidity of the air? Yes; west of the range rainfall comes generally with a westerly and north-westerly wind.

Winds preceding droughts.

871. What winds usually precede droughts? I do not think I could answer that question.

872. Do the winds which precede them blow continuously from any one quarter? No. As I have said, there is so little wind in the interior that you can hardly determine a general direction. The winds are very variable. In the west, when wind descends, it is dry; when it rises, on its way back to the sea, it is moist. If a wind rises over the main range, it brings rain. That same wind may have been driven inland by easterly gales. It is dry to the west of the range, but when the wind returns it rises and rain is deposited.

873.

873. To what depth of water and soil do solar rays take effect? Earth temperatures are recorded in Sydney at various depths, down to 19 feet 6 inches; I have no record below that. The highest temperature recorded at 19 feet is 65·8°, and the lowest is 59·70°. At 2 feet 6 inches the range varies from 64° to 52°, or about 12 degrees. H. C. Russell, B.A. 14 Aug., 1884.

874. *Mr. Gipps.*] Is that in soil or water? In soil. Effect of solar rays on soil and water.

875. Your observations have no reference to water? No.

876. Then it would be actual temperature? Yes; the thermometer is buried, and the observation is taken from that.

877. You have no observations with reference to water? No. I have the temperature of the water in Sydney Harbour, 3 feet from the surface, but that is affected by the tidal water.

878. You do not know to what depth the atmospheric temperature affects the water? I have no record of it.

879. Do you consider that the prevalence of a particular wind, or the frequency of rain in any locality, is influenced by the proportion of humidity in the air? I think it is the other way—humidity is influenced by the wind. Influence of wind on humidity of air.

880. What is the daily range of humidity in the eastern, centre or hilly, and western districts? I could not answer from memory. It is impossible to ascertain the range of humidity unless you have self-recording instruments. Range of humidity.

881. Would it not be possible to obtain them? The expense would be considerable. We have them in Sydney.

882. *Chairman.*] I suppose the chief difficulty as regards their employment in the interior would consist in getting people to take the observations? Yes; the chief difficulty lies in the neglect of observers to keep the thermometer wet.

883. Could you tell us how many degrees the dew-point generally is above or below the temperature of the atmosphere in the districts I have already named? The dew-point is seldom or never published by any Observatory. The reading of the wet and dry bulbs from which the dew-point is calculated are published, but we give the relative humidity in preference to the dew-point. Dew-point.

884. *Mr. Gipps.*] Do you not consider it reliable? Humidity is considered of more use. The dew-point is troublesome to calculate, and it is of little use, and from published observations the dew-point can always be obtained if wanted.

885. *Chairman.*] What is the mean force or pressure of vapour in the atmosphere? It could be arrived at from the published records. Pressure of vapour in the atmosphere.

886. Do you consider that in the summer months, namely, in November, December, January, and February, the humidity of the air in the western district reaches saturation point? It seldom or never reaches saturation point in the western district; it does not often do so in Sydney. Saturation point of humidity of the air.

887. What is the percentage of vapour in the air at such high heats in proportion to what it might hold? In extreme cases we have a humidity as low as 30 per cent., that is to say, there is only 30 per cent. of that which might actually exist. That is an excessive dryness, and it is seldom exceeded. It is only found about once in a year. Percentage of vapour in the air.

888. Do you think that such low humidity is prejudicial to vegetation? Of course a humidity which I have named exists only in a severe hot wind. Vegetation is then affected as if there had been a frost; all the young leaves are cut off—the evaporation goes on so fast that it kills them. Evaporation.

889. What is the lowest pressure of vapour recorded in the dry districts? I cannot answer that from memory. I have published the results of many experiments on evaporation, in the paper which I have not yet given to the Commission. It contains some observations made by me, and detailed in a report given to the Meteorological Conference which met in Melbourne in 1881 (*Appendix* E 3). If the Commission desire it, I can send copies.

890. *Mr. Murray.*] Mr. Czarlinski described an instrument used for testing evaporation—it was a glass tube, with discs of blotting-paper? I do not see how you can get by that means at the evaporation which takes place from the soil or from water. Nature does not hang up a piece of wet material to dry. I should not think that test of any use in measuring evaporation. Any such contrivance measures evaporation under conditions unlike those which exist in nature, and is therefore of no use for practical purposes. Evaporomètre.

891. I believe Mr. Czarlinski's contention is that the water is absorbed under the same conditions as those which exist on the earth's surface? I do not agree with him. What we want to know is the amount of evaporation from water and soil, and I think we must measure its amount from *water* and *soil* if we would have a correct result. Evaporation from water and soil.

892. Do you think that if the humidity of the air could be preserved, even though the rainfall should be small, such a condition would encourage vegetable growth? Plants seem to grow better in air which is moist. There is no doubt that if you could keep it at anything like saturation point the plants would absorb a certain moisture. Effects of humidity of air on vegetable growth.

893. Would the cultivation of forests over large areas have any influence in obviating the dryness of the air and in inducing humidity? I do not think so. My own conviction is that it certainly would not. The humidity would be greater in the forest, but only at the expense of the soil. Experiments made in forests show conclusively that they are equivalent to a drying machine, as far as the rainfall is concerned. Influence of forests.

894. *Mr. Gipps.*] But they keep a certain amount of humidity in the air? Yes, as I said just now, at the expense of the soil, for they pump it up by their roots, and the wind carries it away.

895. Have you made experiments with the potometer for testing the humidity given out by different plants and trees? Careful observations have been made as to the effects of forests in Europe. A moderate-sized chestnut-tree, for instance, has been taken as an example. The exact amount of water evaporated has been discovered, and it has been found that such a tree can get rid of about 16 gallons of water a day. In America it has been shown that forests have no effect at all upon the rainfall; that the plains in the neighbourhood of forests have as much rainfall as the forests themselves. The same thing is common all over this Colony; there is no more rain in the forest land than in the plains, if both are flat. Potometer.

896. Do you not consider that water would be more valuable if given out in this way and distributed through the air, than if it were allowed to sink into the ground and disappear into an under-ground basin, from which we could not obtain it? I think not. If you have trees in such abundance as to serve such a purpose, you could have no use for the land at all except the growth of timber.

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897. But you are preserving the vegetation? You are preserving only trees. If you had that number of trees, you would certainly do away with the possibility of growing grass.

Records of temperature, evaporation, and wet and dry bulbs.

898. *Chairman.*] Have you any table showing the relative value of temperature—dew-point, rainfall, and evaporation? I have records of temperature, evaporation, and wet and dry bulbs; but, as I explained just now, I publish the humidity—not the dew-point.

Forests do not affect the rainfall.

899. *Mr. Gipps.*] Are we to understand that the more you denude the country of forests the larger the supply of water will be? I do not think you will get a larger rainfall; in fact I do not think it would make any difference. All the evidence I have seen goes to show that the cutting down of forests does not affect the rainfall. A great mistake was made by Humboldt years ago when he said, on very incomplete data, that the cutting down of forests had an effect upon the rainfall. He went into a place in South America; like many new districts in this country the forests were cut down and the timber was burnt; in a short time a lake near the place dried up, the town was left without any water and had to be deserted, and the timber, which was of a semi-tropical character, grew up again, and the water returned to the lake. Upon these imperfect data Humboldt said that the cutting down of the trees sent away the water. During the same years, however, Lake George, in this Colony, dried up and filled again. Not a single tree in this vicinity had been cut down, unless they had been cut down by the blacks. This shows conclusively, I think, that the reason of the drying up of lakes was a decrease in the rainfall affecting the whole world. Such changes are continually going on, and are shown by any general records. I have disclosed much the same thing in a rainfall map for 1882, showing that a variation in the rainfall of England and of this Colony was going on simultaneously. This must be due to some cause outside of the earth; it cannot be due to anything in the earth itself; it must be due to something affecting the amount of heat received by the atmosphere. No satisfactory evidence has been brought forward that the cutting down of trees produces a loss of rain. I know that such statements are made, and confidently made, with a large semblance of authority, and I know that in making the statements which I am now making I am saying that which is in opposition to the opinions of a great many scientific men; but on the other hand, it has been shown by Mr. Symonds and others that there is no indication of rain decreasing in Europe, in spite of the enormous destruction of forests during the 200 years over which the rain observations have extended, and the same has been proved of America by Professor Marsh and others. My own opinion is based on a careful study of the subject, and a comparison of all the facts which have come in my way. In our own country, for instance, a considerable amount of forest devastation has been going on for the last twenty years—I believe an unequalled amount of forest devastation; and during that time we have had a gradually increasing rainfall. It is true that the last year or two have been comparatively dry, but that is the result of some cause external to the earth, as is proved by the dry weather in the northern hemisphere, and has not been in any way due to the cutting down of trees, which has been continued in precisely the same way during the past two or three as in previous years.

900. *Mr. Gipps.*] Those who have travelled much cannot have helped noticing the difference in the rainfall in heavily and lightly timbered country? Yes, I know that is a common impression; but it is, I think, more than probable that it puts cause for effect, *i.e.*, that the rain causes the forest—not the forest the rain.

THURSDAY, 21 *AUGUST*, 1884.

Present:—

Mr. BARTON, M.P.,	Mr. LYNE, M.P.,
Mr. FRANKLIN, C.E.,	Mr. M'MORDIE, B.E, C.E.,
Mr. GIPPS, C.E.,	Mr. TOWNSEND.

W. J. LYNE, Esq., M.P., President, in the Chair.

Charles Smith Wilkinson, Esq., F.G.S., F.L.S., called in and examined:—

C. S. Wilkinson, Esq., F.G.S., F.L.S.

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901. *President.*] Your name is Charles Smith Wilkinson, and you are the Government Geologist? I am an officer of the Department of Mines, and my official title is Geological Surveyor in Charge.

902. For what length of time have you held that position? About ten years.

903. I presume that you have travelled nearly all over the Colony? Over the greater portion of it.

904. And you have had opportunities of inspecting the different geological formations? Yes.

905. Have you travelled much over the northern portions of the Colony? Yes, to within 20 miles of the Queensland border.

906. Have you been on the northern rivers at all? I have been at the heads of the M'Intyre, the Severn, and the Mole Rivers. I have examined the country in the district of Inverell.

Nature of formation in district of Inverell.

907. What is the nature of the formation there? Chiefly granite and older primary rocks.

908. You would call that impermeable country? Yes.

909. Have you been lower down the M'Intyre than that? Not below Inverell in that district.

910. Taking the country as a whole, are there any permeable strata through which the rainfall would get away? Certainly not, except through irregular local escapes, through quartz-reefs and irregular fissures which occur here and there, but not through the regular strata.

Mining shafts.

911. Have you any sections of wells in that part of the country? No; but I have particulars respecting mining shafts sunk in the district.

Mining shafts at Emmaville.

912. Can you give us any information respecting those? Yes, I have some information respecting those sunk on the deep leads at Emmaville.

Depth.

913. What is about the depth of those shafts? If I remember rightly, about 200 feet. Nearly all the shafts were dry until that level was reached—I forget the exact depth—and then a great abundance of water was met with, necessitating the use of pumping machinery.

914. What was the nature of the strata passed through? Clays and basalt.

915. Then the inference would be that when the shafts reached that particular level they reached country which was impermeable below? Yes.

Water supply.

916. Have you any similar information respecting gold or other mines in any other part of the Colony? No, I have no information regarding underground water-supply from mines, excepting those in the Guigong Forest Reefs and Lachlan Gold-fields.

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917. You mentioned Emmaville? Yes; the shafts to which I refer have been sunk near there.
918. Do you know anything about any shafts sunk elsewhere in that part of the country? Yes, in the Cope's Creek district, to the south, there are deep leads similar to those, and continuing to Inverell.
919. Is the country of a similar nature? Yes.
920. Did they find there that when they reached the depth you have stated water came in in abundance? Yes; and I may mention that these deep leads are old river channels which have been filled up by sand, clays, and basalt, and therefore they carry the underground drainage of the country. Old river channels.
921. Have you ascertained whether they continue any distance? They must continue right to the plains.
922. I suppose that the water which accumulates and goes down the old river-beds does not appear again on the surface? No.
923. Do all those channels drain in the direction of the plains? Yes, that is, westerly. Direction of drainage.
924. Are these river-beds met with in any other part of the north of New South Wales? I have seen evidence of them all along the flanks of the Dividing Range. Old river-beds along flanks of Dividing Range.
925. South of the point you have described? Yes.
926. Can you mention any particular localities? Yes, in the Armidale district; in fact at irregular intervals all along the Dividing Range you find great tracts of basalt. The lava has flowed down and filled up some of the old valleys and now forms the plains, so that we cannot indicate exactly under the plains where the leads occur. All that we know is that the old drainage system, which was uniform throughout the Colony prior to the basaltic outbursts, has been covered up by lava in places. Old drainage prior to basaltic outbursts.
927. Then you would expect to find water lower down, underneath the lava? Yes. Water under lava.
928. Going south from Inverell to the mines near Orange and Lucknow, do you find the same thing there? Precisely the same physical features.
929. I suppose the water there would be trending down towards the Macquarie and the Bogan? Yes, it flows westerly, but the lava at Lucknow flows in a south-westerly direction, while the drainage of the country flows to the north-west. The lava flowed into the old valley and formed a new watershed which diverted the rainfall, but the general trend is westerly. New watershed.
930. Have you any idea how far west the lava flows? In that district it does not extend beyond about 25 miles from Orange. Extent of lava.
931. Does it continue about the same parallel north? No, the volcanic outbursts occur at irregular intervals all along the Dividing Range.
932. What I want to ascertain is the mean distance that the lava has extended westerly from the Dividing Range—to what degree do you consider it extends? A line drawn from Albury to where the 149th meridian crosses the Macintyre River is approximately the western limit of the basaltic outbursts. Western limit of basaltic outbursts.
933. From the top of the Dividing Range approximately to that line, where would you expect to find the water; the rainfall gets away on the surface, and I suppose the water will be found underneath the basalt? Yes.
934. What is the nature of the country beyond the limit of the basalt? The surface is generally covered by sandy loam and clay deposits forming the plains. Soil of the plains.
935. When the water gets to that point will it be found underneath the clay? Yes.
936. The clay takes the place of the basalt? The clay overlaps the basalt in places. Since the lava outbursts the rainfall has swept a lot of *débris* from the Dividing Range, and this *débris* has partly covered the basalt. Clay and basalt.
937. Do you know of any instance where the water appears further out in the plains in the shape of springs? There are numerous springs throughout the whole of the western country, but they are mostly due to local causes.
938. You do not consider that the water comes from the Ranges? Not in all instances.
939. Have you known any instance where these old river-beds have been traced further into the plains than the edge of the basalt? Fresh water has been got in many wells, but I am not aware of any system of underground channels having been discovered under the large plains. Old river-beds in the plains.
940. Do you know of any instance where the old river-beds have been struck in the western country? No. If you will allow me, I will refer to a report which I drew up for the information of the gentlemen who were appointed a Commission to inquire into the working of the Land Laws. My report is—"On the prospect of obtaining fresh water below the surface in the districts beyond the rivers Lachlan and Darling and beyond the river Darling." Since I wrote that report I have travelled over country which up to that time I had not examined—the vast plains to the west, extending to the Barrier Ranges. I should like to hand in this report, because there is nothing in it which I desire to alter materially. It expresses my views on the subject clearly. I have only to make a few additions to it. There are five formations in which water may be found (*Appendix* F 1):—1st. In the recent alluvium chiefly along the main rivers and creeks. 2nd. In the older alluvial deposits which form the east plains of the low-lying portions of the Darling and Lachlan Districts. In these, however, salt water is of frequent occurrence. Area, 118,000 square miles. 3rd. In the miocene marine beds. I am not aware if any wells have yet been sunk in these beds, but from their lithological character I believe that they will yield abundance of fresh water. Area, 22,000 square miles, underlies No. 2. 4th. In the cretaceous formation. This is a most important source of supply, and one which will probably yield artesian water. Area, about 32,000 square miles. 5th. In the palæozoic rocks, but the occurrence of a large supply of water of good quality in these is exceptional. Area, about 22,000 square miles. Since I wrote that report I have ascertained that water has been struck in two or three wells in the cretaceous formation, thus proving my remarks to be correct. Report to Land Laws' Commission. Water-bearing formations.
941. At what depth? From 80 to 427 feet.
942. Where do you suppose the water came from—is it surface water? Not local surface water. I may explain to the Board that a feature of the geological formation of New South Wales which is not generally known is that at present there is a main dividing range running parallel with the coast. In the early times, before the present epoch, there was also a dividing range running off at right angles from the existing coast range, and extending from about the middle of New South Wales, say in the Bathurst district, in a north-westerly direction, right through Western Australia. This range consists of primary rocks. Source of the subterranean water. Old dividing range.
943. *Mr. Gipps.*] Can it be traced now? The rocks may be traced near the surface, but owing to the enormous denudation that they have since undergone, the country has been levelled down in places, and covered by pleistocene deposits. At that time when the range existed all the land coloured light blue

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on the map which I produce, situated in the north-western portion of our Colony, and extending right away to the Gulf of Carpentaria, and probably to Port Darwin, was under the ocean. There the cretaceous beds were deposited, and this range formed the southern margin of this cretaceous ocean. In all such deposits where there are such huge basins as that to which I am referring, the strata always incline up to the margin of the shore line; therefore by sinking in any part of this deposit we are sure to get water which will rise to the level from which it soaks in around the edge of this old shore line; because the first beds deposited in this ocean in places near its shore were of rough stones and gravel washed from the hills, the lighter material being swept further away, and when it settled it formed clay and mudstones. By compression these mud-stones and clays have formed the impermeable beds through which we would have to sink before striking the lower gravel beds. Wherever this country is lower than the old shore line, the water when once struck in the gravel beds will rise to the level from which it comes around the flanks of the range.

Cretaceous ocean.

Rise of water.

944. *President.*] So that if the water comes from the range which is partly covered, it will not rise to the surface of the land further on? Yes, it will; because the clay beds which dam the water back run right against the beds deposited at a higher level. For example, at Dunlop's Station a well was sunk 670 feet before water was struck, and then it rose to within 10 feet of the surface. That is a higher level than the gap or channel of the Darling River. The clay beds which were pierced in this well ran against the flank of the range at a lower level than the present Darling Gap, which is quite a recent feature.

Darling Gap.

945. *Mr. Gipps.*] What is the depth of the Darling Gap? It is not known. I think it is very shallow, because the gap exists between formations which are only about 5 miles apart, and you see rocks cropping up on the surface about there. Therefore, I think that the Darling Valley would be very shallow.

946. *President.*] What is the difference between the height of the surface of the Barrier Range and the north of the Darling? I am not aware—I forget what the exact height of Wilcannia is above the sea-level.

Wilcannia, on south side of old range.

947. *Mr. Barton.*] Is Wilcannia on the line of the old range to which you refer? It is on the south side of it. Some of the country is 1,000 feet above the sea-level. There have been local upheavals to cause this.

Mount Murchison.

948. *Mr. Gipps.*] I suppose that remark would apply to Mount Murchison? Mount Murchison is a denuded portion of the old range.

Extent of old range.

949. *President.*] Have you any idea how far south it extended beyond the Queensland border into South Australia? The maps show that the range runs round into South Australia to the Flinders Range, forming the southern margin of the cretaceous area. I have travelled across the country to Adelaide, and have seen the primary rocks cropping out at the surface for nearly the whole distance.

Water from bores in South Australia.

950. *Mr. Gipps.*] Then the adjacent country must be almost like an inland sea? Yes. In South Australia a bore was put down 1,220 feet, and when water was struck it rose 20 feet above the surface.

951. *President.*] That is in the basin I suppose? Yes. A short distance to the west another bore was put down 330 feet, and the water rose 40 feet above the surface. That was at Hergott Springs. In this case the bore was 8 inches diameter, made by a diamond drill.

952. *Mr. Townsend.*] Did it choke much with sand? No, there was no trouble with sand.

Its source.

953. *President.*] Do you think the water comes from different strata in the two cases? I think not, because the western bore is not far from the watershed, that is from the range. The 1,200 feet bore was almost in the centre of the basin. The reason of the water being struck at a shallower depth in the other bore was because it was so near the edge of the basin.

954. Your theory is that the water that is struck in these two bores came from the range to the basin? Yes.

955. It is not water that comes from Queensland or from the heads of our rivers? Not exactly; it is water that has soaked into the formation around the flanks of the old range.

956. Have they tested the depth of that water in North-west Queensland? Not that I am aware of—I am not aware of any water having been struck there.

Flinders Range.

957. In speaking of the Flinders range, to which range do you refer? I mean the range to the north-west of Adelaide. Since I have been over the country I have been able to add to the cretaceous area the portion coloured light blue on the map. I desire to submit this map (*Appendix F* 2) because it shows the extent of the cretaceous area, in any portion of which artesian water is likely to be found.

Bar across the Darling.

958. *Mr. Townsend.*] Have you ever examined the rock in the bar across the Darling just below the township of Wilcannia? Yes, I have seen it.

959. Is that part of the old range? Yes, I think it is.

Barrier Range.

960. Do you consider the Barrier Range a continuation of that range? Yes.

Water south of it.

961. *President.*] You do not think there is any artesian water south-west underneath the Barrier Range? No, not under the Barrier Range; but south of the range you may get water by boring (say) about 400 to 1,000 feet. I think if bores were put down to that depth the water would rise to the surface or very close to it. The formation is quite different from that north of the range.

Formation south of Barrier Range.

962. What is the formation south of the Barrier Range? The surface of the plains is loam, sand, and clays, but south of this again on the line which I have drawn on the map, and to which I have referred in my report, there is another marine formation, in any portion of which I feel quite sure that fresh water can be obtained.

Miocene formation.

963. Does that water come from the Barrier Range? Yes; I think this miocene formation collects the underground drainage of the range. It is quite possible that this formation extends south to the coast of Victoria and South Australia, where the rocks form the cliff. We cannot tell how far it does really extend to the south, but I have no doubt that the underground water escapes into the ocean. That is proved by the underground channels which exist in the Mount Gambier district, where the water at some places is said to run at the rate of 4 or 5 miles per hour. This being limestone formation it is easily dissolved by the underground currents, and thus channels have been formed. There are no open channels in the great cretaceous area which I have described—there is merely soakage of water from the gravel-beds.

Underground channels in Mount Gambier district.

964. Do you say there are no old channels? There are no defined channels or caves, but there are layers of gravel in some places 10 feet in thickness, and extending probably 50 or more miles across.

Surface of the cretaceous beds.

965. Is the surface of the cretaceous beds in the northern basin impermeable? The surface of the cretaceous strata is impermeable, as a rule.

966. If the surface is impermeable, how do you account for the rain-water disappearing? The surface of the

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the range being impermeable, the water runs into creeks and gullies, and from these soaks into the gravel-beds which extend under the plains; therefore much of the water passes into the underlying cretaceous beds.

967. Then you say there are places where the surface water soaks down and gets underneath the impermeable strata? Yes, near the base of the hills or ranges.

968. And that we may expect to find artesian water all over that basin? Yes. Artesian water south of old range.

969. Does the same thing take place south of the range? Yes. I may explain that the layers in this formation are horizontal, and that where limestone occurs, it being easily dissolved, open channels may be formed.

970. Do you think that the water in the south-western basin comes from the western range in Queensland? I think that it comes from the range which runs into South Australia. Its source.

971. How far does the old range extend west—does it go as far as Western Australia? I am not aware, but I know that it extends to the north-west beyond Adelaide.

972. *Mr. Barton*.] Is it not a continuation of the Gawler Range? Yes. Gawler Range.

973. *President*.] Can you name any particular points where it exists in New South Wales or in South Australia? I have traced it from Wilcannia right across to Adelaide.

974. At what point does it cross our border? It intersects the boundary line where the 32nd parallel of south latitude crosses the border, and it goes across north of Wilcannia, making a curve to that point; thence it goes to Cobar, and from Cobar to Parkes, and from Parkes to Orange. Direction of old range.

975. From Cobar, I suppose, it forms the watershed between the Bogan and the Lachlan? Yes. Watershed.

976. *Mr. Townsend*.] I suppose you have seen the lakes at Mount Gambier? No, but I have read reports respecting them.

977. *President*.] I suppose you have inspected the Fish River Caves? Yes. Fish River Caves.

978. There is a stream of water there which has never been traced to its source? It is simply a local stream; it is only an underground stream for about a quarter of a mile. At the entrance there is a limestone rock, about 20 chains wide, running north and south, and the water goes through this and comes out again immediately below the caves, where it is an open creek.

979. *Mr. Townsend*.] The limestone is blue, hard limestone—not the ordinary limestone? Yes.

980. It is quite different from the limestone at Mount Gambier? Yes.

981. *President*.] Have levels been taken, and has it been proved beyond doubt that the water which comes out into an open channel at the Fish River Caves does not come from a submarine channel? I do not think that levels have been taken, but it must be obvious to any one who examines the locality that what I have stated is correct. Source of the water.

982. Is the water in the open channel continually running? Yes, but it varies according to the rainfall and the quantity of water running into the creeks above.

983. *Mr. Townsend*.] Have you noticed a similar thing in Cave Creek, near Orange? No, but there is a similar thing on the Bellabula River. Cave Creek, Bellabula River.

984. *President*.] You said it was well known that the water flowing from the Barrier Range southwards went underground to the ocean? Yes. Underground course of water from Barrier Range.

985. Do you know of any place where it has been traced to the ocean? I do not know of any particular outlet to the ocean, but there are underground rivers near Mount Gambier flowing in the direction of the ocean, which is not far distant.

986. Do you know whether it has ever been discovered that water in the ocean, for a short distance from land, has been fresh, or partially fresh, after heavy rains on land? No.

987. Do you think that the water which is contained in the extinct volcanoes, or lakes as they are called, at Mount Gambier, comes from the range to the north, to which you have referred? I gather from the Geological Surveyor's report of the district, which report was recently made, that the water stands at the same level in the lakes as it does in the strata, through which there is a current southwards. Water in the extinct volcanoes at Mount Gambier.

988. Does the water in the lakes rise and fall as the current in the underground river increases or diminishes? I cannot say. I do not think that there can be much rise or fall. These channels drain such an immense area of country that I think the level of the water would be almost permanent—it could not be affected by local rainfall. Rise and fall of water.

989. We have it in evidence that the water in the lakes does rise and fall at certain periods? The question is dealt with in a report prepared by the Geological Surveyor of South Australia, of which perhaps it would be well for you to get a copy. A great deal of information is to be obtained from the report of the Chief Officer of the Water Conservation Department in South Australia—that is, respecting deep wells and bores. Report of Geological Surveyor of South Australia.

990. Can you give us any approximate idea as to what portions of the Colony may be considered permeable and what are impermeable? Generally speaking, all the primary rocks are impermeable. Of course there are exceptions where there are quartz reefs and fissures. I have referred to that subject in my report. Permeability of rocks.

991. Would it be possible, from the information which you have collected, to mark on a skeleton map the position of the different kinds of rocks? They are shown in the geological map which I have produced. The areas marked in dark colours represent impermeable rocks, and those in lighter colours permeable rocks. I believe that on nearly the whole of the area marked in green and blue there are abundant supplies of water underground. Geological map.

992. Is the surface to the south of the range to which you have referred impermeable? No; it is all loamy sandy country, forming the plains, into which water soaks freely. Sandy country.

993. Is the country between the Murray and the Murrumbidgee permeable? Yes; all the Riverina country is. Permeability of Riverina.

994. Have you any particulars respecting wells sunk in that country? I have heard of a great many wells having been sunk and of water being found, approximately, at the same level. Wells in Riverina.

995. Do you know that in that country after the clay beds have been pierced the water rises nearly to the surface? I have heard of that, but I have no information as to the exact height to which water has risen. Rise of the water and formation of the country.

996. The stratum which keeps the water down is impermeable? Yes. There are local clay beds. These plains have been formed by floods, which have washed down *débris* from the Dividing Range. In places where the current has been very strong sand and gravel have been deposited, and where the water was comparatively still mud has been deposited, which in course of time has become impermeable clay.

997. Will that apply to all the country between Wilcannia and the Murrumbidgee? Yes; the same general features will be found to exist right across that country. 998.

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998. This local formation has been caused by floods washing clay and *débris* from higher land? Yes. It is quite a different deposit from that in the north-western part of the Colony, which is all marine. The fact of its being a fresh-water formation in the country to which you refer is the reason why salt water is generally found in it, because the rain-water washing the dirt from the ranges caused it to be deposited quickly, and in course of time, owing to the moisture contained in it, the minerals decomposed, and made the fresh water salt. Sulphate of alumina, lime and magnesia, &c., have been formed, and thus salts have been chemically formed in these beds. In the marine formations the soluble parts of the minerals have been washed out by the long-continued action of the sea-water, therefore it is that you nearly always get fresh water in these beds. Wherever there is an underground current and the water finds an outlet through the underground beds there you will get fresh water; whereas, a hundred yards away where the water is stationary you will get salt water.

Fresh water in underground currents.

999. *Mr. Townsend.*] Have you ever examined the Coonapara Range? I have not.

Coonapara and Western Range.

1000. *President.*] Mr. Townsend says that in the locality to which he refers the beds in places are very permeable; the creeks come down "bankers" for a certain distance and then lose themselves entirely: can you inform us of any other places where that occurs? I have noticed it in many instances; it occurs all around the flanks of the Western Range—it is one of the common features in that part of the country.

Willandra Creek

1001. It occurs in the Maroo and Willandra Creeks? I believe that it does. With the permission of the Board I should like to read the report to which I have previously referred. I shall make some interpolations as I proceed.

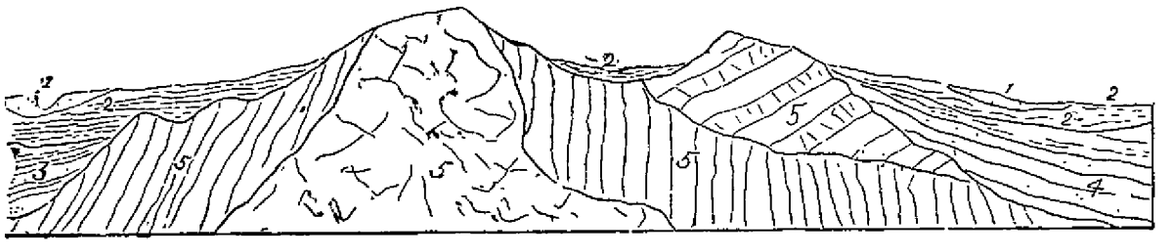
Report.

Report on the prospects of obtaining fresh water below the surface, in the districts between the rivers Lachlan and Darling, and beyond the river Darling.

In accordance with your request, I now report on the prospects of obtaining fresh water below the surface in the districts between the rivers Lachlan and Darling and beyond the Darling.

There are five geological formations which may be regarded as sources of underground water supply; 1. Recent: 2. Pleistocene and Pliocene; 3. Miocene; 4. Cretaceous; 5. Palæozoic formations.

The following sketch section will serve to show the relative position of these formations—



No. 1.—The recent deposits form the sandy and gravelly beds of watercourses, the alluvial flats bordering them, and the muddy accumulations in progress in swampy hollows. Good water is generally found in them at various depths, rarely over 40 feet, especially in the alluvial flats near the larger rivers and creeks, but seldom near the heads of the creeks. Therefore, in the latter localities, where water is most required owing to the rapid disappearance of surface water, they are of but little importance as sources of supply.

No. 2 are older alluvial deposits, of much greater thickness, being sometimes 300 feet thick, and more widely spread than those just mentioned. They compose those clayey and loamy plains which, commencing in the larger valleys, gradually spread out and form extensive areas of level country, such as we see throughout a very large portion of the districts under consideration. When we consider that these deposits, which consist of the disintegrated rock material swept down by floods from the higher lands, have filled up valleys and hollows in the old land surface, we can readily conceive that they absorb an enormous amount of the rainfall which becomes stored in the sand and gravels lying in the old hollows. As the existing surface features show little or no indications of the buried hollows, it is sometimes only by repeated boring or sinking that the water-bearing drifts may be discovered. The rain-water soaking into these deposits is, at uncertain depths, arrested by beds or layers of impervious clay. Where the water passes freely over these to lower levels it is generally of fresh or drinkable quality; but where it does not circulate freely but is retained for a long time in saucer-like depressions formed by the clay-beds, it dissolves much of the mineral matter of the strata and thus becomes brackish. In some respects, therefore, these underground stores of water resemble many surface lakes—the water in those having no outlet being often salt, while in those which have an outflow it is fresh. As these retaining clay beds do not usually extend far in any direction, it often happens that fresh water may be found in one well only a short distance from another yielding highly saline water; and after passing through a salt-water bed the next water struck may be fresh. These varying conditions are but what we might expect in strata which have been deposited in such an irregular manner. The practical results then of our observations are, that water is likely to be found in these deposits at different depths to 300 feet, that if salt water be struck it may be only patchy or local, and that fresh water may occur near or below the salt; and further, that the water being fresh is evidence of its having free circulation, and thus is capable of being traced for considerable distances.

No. 3. *Miocene.*—This formation is only seen in the banks of the Lower Darling; but there is little doubt that it extends under the No. 2 deposits, which form the level country south of a line drawn from Booligal on the Lachlan to Menindie on the Darling, thence west to the South Australian Border. One or two bores in this district would prove the existence or otherwise of this marine formation; and where it occurs I believe that abundance of fresh water will be found in it.* The probable depth of sinking will be from 200 to 500 feet, and though the water may rise to a higher level than when first struck, it is only when the water-bearing strata are covered by impermeable beds that it is likely to rise to the surface; and as the overlying deposits of No. 2 are generally of a porous character, the occurrence of artesian water in the miocene beds will be exceptional.

No. 4. *Cretaceous.*—If a line be drawn from 31½ south latitude on the western boundary of the Colony, thence north-east 140 miles, and thence south-east to the Darling River, thence following up the Darling until it crosses the Queensland Border, thence along that Border back to the north-west corner, it will approximately include the area occupied by this formation. In nearly the whole of this large extent of naturally dry country it is probable that a permanent supply of good water will be obtained by bores or wells sunk to various depths within 700 feet from the surface, and that the water may be expected in many instances to rise to the surface. The numerous "mud springs" occurring in this area may be regarded as natural artesian wells, the water being forced up through fissures in the cretaceous strata, and thus affording evidence of the great store of underground water which may readily be made available by tube bores of large diameter. At Wee Watta, on the Kallara Run, Mr. David Brown bored with a 4-inch tube into some mud springs, and at a depth of 144 feet obtained water, which flowed from the tube at a height of 26 feet above the surface, at the rate of 60,000 gallons per diem; but this quantity gradually diminished, owing to the tubes becoming filled with sand. The same gentleman was also successful in obtaining artesian water at the Mullyeo mud springs. On the Dunlop Run Mr. James Wilson struck a good supply of water in the cretaceous beds in the Mount Wilson well, at a depth of 488 feet, which rose to within 90 feet from the

* Water has recently been obtained at a depth of 160 feet, on Mr. F. L. Parker's Buckalow Station, about 30 miles north of the Darling and close to the South Australian Border. The supply is abundant and apparently permanent.

Since this note was made by Mr. Morris, I have been informed that water has been struck at Ita in the same district at 240 feet, and at Wonga at 270 feet.

the surface. In the No. 2 Kapiti well, 20 miles west from the Mount Wilson well, a splendid supply of water was met with at a depth of 572 feet, the water rising to within 10 feet from the surface. In another well at View Point Mr. Wilson obtained good water at 536 feet deep; this rose to within 40 feet from the surface. In sinking these wells salt water was passed through in the pleistocene deposits, which are here about 100 feet thick, overlying the cretaceous formation. C. S. Wilkinson, Esq., F.G.S., F.L.S.

The other day I ascertained that not far north of Wilcannia, where the cretaceous beds come in, several wells were sunk to between 245 and 301 feet, and after the cretaceous beds were struck the water rose to within 65 feet of the surface. As this is so near to the margin of the southern bed I am sure that if bores were continued to a greater depth the water would rise to the surface. This formation is of great importance, for by putting down bores to a sufficient depth I believe that enough water would be obtained to supply the whole of that country. In one Government bore, 50 miles west of Bourke, good water rises at the rate of 600 gallons per hour from a depth of 201 feet, and flows from a pipe 21 feet above the surface of the ground. In another Government bore, 6 miles further west, from a depth of 427 feet, water flows at the rate of 180 gallons per hour at 3 feet 3 inches above surface; bore still sinking. 21 Aug., 1884. Rise of water in wells in cretaceous beds.

The importance of the information afforded by these discoveries and by the wells of the Mount Poole district cannot be over-estimated; for, taken in connection with the geological evidence, it assures us of the almost certainty of obtaining an abundant water supply from the cretaceous formation, which here occupies an area of about 40,000 square miles, though covered in places by alluvial deposits.

No. 5. *Palæozoic Formations.*—These include the Silurian, Devonian, and carboniferous sedimentary formations, consisting of slates, limestone, sandstone, and conglomerates, together with granitic and trappean rocks. These rocks appear at the surface and form the hilly country between the Upper Bogan River and the Lachlan, and with the exception of several irregular intervals of low-lying country, extend in a direction west-north-west right across the centre of the Colony, embracing an area of about 22,000 square miles. As a rule these formations are of an impermeable character, and constitute the bed rocks upon which the cretaceous and newer sedimentary formations have been deposited; therefore, in sinking through the latter, when the former have been reached, it is almost useless going deeper with the hope of finding a good supply of water. There are however exceptions; for sometimes the older rocks are intersected by quartz and other veins and joint-fissures, which, acting as drainage channels, afford a supply of water, generally of brackish quality but suitable for stock; nevertheless the chances of meeting with such water-bearing fissures in sinking or boring is very uncertain.

The areas where these old formations come to the surface must therefore depend for supply upon the rainfall conserved in tanks and dams; and fortunately the hilly or undulating features which are generally characteristic of such formations present most suitable sites for reservoirs and form good collecting grounds. Such country then is not without its advantages for obtaining a storage supply of water; and though dependent upon the intermittent rainfall, yet, from Mr. Russell's valuable maps, it would appear that this is sufficient to supply properly constructed reservoirs capable of holding out through ordinary seasons of drought.

In the Silverton district, which suffered so much during the recent drought, all the small tanks failed; but tanks 80 yards square by 25 feet deep held out all through the drought, although the average rainfall is only about 9·4 inches. At Silverton, just before I arrived there in June, the town was partly flooded, although only about half an inch of rain fell. The water which ran down the gullies covered the flats 1 foot deep. In the creeks I saw flood-marks from 1 to 12 feet above the sandy beds. These facts show that although the rainfall may be small, yet where the primary rocks exist there is every facility for storing water; all that is wanted is the formation of suitable tanks. Tanks in Silverton district. Flood at Silverton.

From the foregoing observations it will be seen that there are five principal formations in which fresh water may be obtained:—

1st—In the recent alluvium, chiefly along the main rivers and creeks.

2nd—In the older alluvial deposits which form the vast plains of the low-lying portions of the Darling and Lachlan Districts. In these, however, salt water is of frequent occurrence. Area, 110,000 square miles.

3rd—In the miocene marine beds. I am not aware if any wells have yet been sunk in these beds; but from their lithological character I believe that they will yield abundance of fresh water. Area, 22,000 square miles; underlies No. 2.

4th—In the cretaceous formation. This is a most important source of supply, and one which will probably yield artesian water. Area, about 40,000 square miles.

5th.—In the palæozoic rocks, but the occurrence of a large supply of water of good quality in these is exceptional. Area, about 22,000 square miles.

The above-mentioned areas can of course be only approximately stated until the extent of each formation has been ascertained by survey.

I have not referred to the natural springs which occur in many localities; for though they have underground sources, they may be more properly included with ordinary surface supplies such as are found in rivers and creeks.

Some remarkable instances of springs and wells are given by Mr. T. K. Abbott, P.M., of Gunnedah, in a paper "*On Wells in Liverpool Plains,*" read before the Royal Society of New South Wales in 1880. This paper affords much valuable information regarding the existence of fresh water beneath the surface.

The area of the whole district under consideration, viz., that extending from the Lachlan River below Forbes to the northern and western boundaries of the Colony—comprises about 194,000 miles; and the number of sheep within it, according to the Report for 1881 by Mr. Bruce, Chief Inspector of Stock, is 16,428,000. Deducting from this 9,900,000 sheep as being depastured at the rate of one sheep to 3 acres on the country within 8 miles from the permanently watered rivers and creeks, there remain 6,528,000 sheep on the country not naturally watered, viz., 147,500 square miles, from which may be excluded 9,000 square miles for useless scrub lands.

Assuming, then, that this dry country has already been improved by means of tanks, dams, and wells to two-thirds of its pastoral capabilities between the Lachlan and Darling Rivers, and to about one-eighth on the north and west of the Darling, and allowing one sheep to 5 acres as its capability when permanently watered, it should carry 2,052,000 sheep in the former district and 5,830,000 in the latter, or together one-half the number of sheep more than it does at present.

Of the above-mentioned 138,500 square miles of unwatered country, 22,000 should be deducted for the area occupied by the palæozoic formations, which necessitates a superficial storage of water. We have thus 117,000 square miles which may be supplied from underground sources, and 44,000 square miles of this area lie to the north and west of the Darling, in more than half of which artesian water is likely to be obtained. As we have seen that the present pastoral capabilities of this dry country may be increased eight-fold when it has been sufficiently watered, an approximate estimate may be arrived at of the value of the land in this portion of the Colony.

The soil in many localities is suitable for agriculture, but on account of the aridity of the climate and the irregular periods when the rain falls, cereals cannot be produced with any certainty.

I would here point out that the palæozoic areas (No. 5) may be regarded as comprising mineral lands. Gold, as at Mount Brown; silver at the Barrier; copper at Cobar, Nymagee, and Mount Hope; coal near Dubbo; galena, &c., have been found thereon, and further discoveries will probably lead to the settlement of a considerable mining population.

The accompanying geological map shows the position of the formation referred to.

I have not considered it necessary for the purpose of this report to enter into further detail regarding each formation. Such information will be found in the report by Mr. H. Y. L. Brown, geological surveyor, on the Geology and Artesian Wells of the Albert Gold-field, Warrego, &c., published 4th November, 1881.

In the Annual Report of the Inspector of Stock, 1880, I reported conjointly with Messrs. Bruce and Gilliat upon the subject of water supply for the stock routes through the north-western portion of the Colony.

I append an important paper by Mr. H. C. Russell, B.A., Government Astronomer, on "*The River Darling—the water which should pass through it,*" read before the Royal Society in 1879; and from this paper some idea may be formed of the sources of the underground supply.

Mr.

C. S. Wilkinson, Esq., F.G.S., F.L.S.

21 Aug., 1884.

Mr. W. E. Abbott, of Wingen, gives much interesting information regarding the natural features and water resources of part of the Darling District, in a paper entitled "*Notes of a Journey on the Darling,*" read before the Royal Society of New South Wales in 1881.

Professor W. J. Stephens, M.A., has contributed to the Sydney University Review, July, 1882, an able article dealing in a general manner with the subject of Artesian prospects in New South Wales.

PUBLICATIONS REFERRED TO IN THE FOREGOING REPORT.

On Wells in Liverpool Plains.—By T. K. Abbott, P.M., Gunnedah. (Read before the Royal Society of New South Wales, 3 November, 1880.)

Report upon the Albert Gold-field, together with a description of the geological formation of the Paroo, Warrego, and Culgoa districts, north of the Darling River, especially with reference to the existence of artesian water (to which subject reference is made in the Reports of the Department of Mines for the year 1880).—By H. Y. L. Brown, Geological Surveyor. Printed, 4 November, 1881.

Albert Gold-field—Artesian Water.—By C. S. Wilkinson, Geological Surveyor in Charge. (Printed, 15 November, 1881.)

The River Darling—the water which should pass through it.—By H. C. Russell, B.A., F.R.A.S., Government Astronomer. (Read before the Astronomical Section, 1 August, 1879.)

SOME considerations respecting the rainfall upon the basin of the river Darling led me to make a few figures in order to test an opinion I had formed some time since, to the effect that but a small part of the rainfall, after making every allowance, passes down the river. I was not however prepared for the result which I obtained, and as it throws some light upon our river system, I thought it would be interesting to the members of Section A.

The basin of the Darling is considerably more than 200,000 square miles, but for my present purpose I have assumed that it is only 200,000 square miles. A great part of this consists of the western slopes of the Great Dividing Range, extending from Orange northwards into Queensland, and upon this part of it the rainfall in an average year ranges from 20 to 40 inches; in the more western districts drained by the Darling the average is from 10 to 20 inches. I have taken 16 inches as the average fall all over it, and this is beyond question under the true amount. Now, upon the best part of the drainage, *i.e.*, the western slopes, it may safely be assumed that ⅛ of the rainfall, averaging there about 30 inches, gets into the rivers; upon the flatter portions this proportion would be less, but in order to make allowance for this, and for the effects of evaporation and be quite within the quantity of water which must run off the land, I have assumed that only part of the rainfall reaches the river.

At Bourke the Darling is said to be 60 yards wide. I have assumed it to be 200 feet, and that instead of the contraction in its channel below the water surface, it has a rectangular section. Its velocity when in flood, 32 feet above summer level, has been carefully measured, and was only two-thirds of a mile per hour, though it has been said that in contracted parts of the river lower down it sometimes flows 1½ mile per hour. I believe the smaller measured velocity to be the more correct, but in order here again to make full allowance I have assumed the velocity to be 1 mile per hour. And I find that after making these allowances, in which you will observe that I have assumed the current to be more rapid and the river considerably more capacious than it really is, while at the same time I have taken the available rainfall at only 2 inches, I find that in order to carry off this small rainfall the river would have to be 100 feet deep; that is, that it would, in order to carry off the rainfall, have to flow as a solid stream of water 100 feet deep and 200 feet wide, at the rate of 1 mile per hour, without any cessation throughout the year. Now, we all know that the Darling not only does not flow in such volume even in the wettest season, but that in a year of average rainfall, such as I have assumed, it is not navigable for more than about six months, and even then does not carry one-third of the water shown above, and that in summer it is very low, and perhaps stops running. What then becomes of the rain-water? A large part of it must do, as it is known the waters of the Barcoo and other rivers do, viz., sink into the ground, to flow at some lower level.

These considerations point to an inexhaustible supply of water from wells, and we cannot be surprised that so many wells have been made and found to confirm the ideas here presented, and there can be no doubt that beneath the surface of our flat country there is an unlimited supply of good water.

It may be objected to the foregoing statement that one-half of the Darling watershed is so flat that very little if any water runs to the rivers, and therefore it is not fair to include it in the estimate. But even if this were true, and I do not think it can be proven, yet it must be admitted that it is over this flat country that so little rain falls; and if the drainage be confined, for the sake of argument, to the western slopes, where the land has a considerable fall, it will be necessary also to take the rainfall of this district, which is at least double of that assumed for the whole basin, and the area of these western slopes amounts to fully 100,000 square miles, so that the water estimated would come to the same. It should be remembered that the rainfall I have used is not that of what may be called a wet year, but simply an average year. What then must be the quantity of water in a wet season which finds its way underground to some outlet?

Notes of a Journey on the Darling.—By W. E. Abbott, of Wingen. (Read before the Royal Society of New South Wales, 1 June, 1881.)

Notes and Queries about Artesian Prospects in New South Wales.—By Professor W. J. Stephens, M.A. (Published in *The Sydney University Review*, No. 3, July, 1882.)

Effect of storage reservoirs on the underground currents.

1002. *Mr. Townsend.*] Suppose a large system of storage reservoirs were initiated along the older rocks on the surface, what do you consider would be the effect of that on the storage underneath in the cretaceous and other rocks? I do not think that it would affect it in the slightest degree.

1003. From what source do you suppose that the underground reservoirs draw their supply? From the same source, but the rainfall is much in excess of the quantity which you could possibly store by tanks or dams.

1004. Suppose it were possible to store all but that which would be evaporated, would the underground supply be affected? I do not think that it would affect it much, if at all. These beds are more or less horizontal right up through Queensland, so that if the source of supply of which you speak were stopped, an underground supply would still exist.

Local rainfall over impermeable beds.

1005. Do you think that the water which falls locally on these beds forms an artesian supply? No, because it cannot go through the impermeable beds. I think that the greater part of it is evaporated.

1006. Then it is only where there is an outcrop of permeable strata that the underground supply is supplemented in this way? Yes, from the ranges.

Soakage of the water of the Warrego, Culgoa, Paroo.

1007. *President.*] Have you any idea as to what becomes of the water in the Warrego, Culgoa, and Paroo Rivers? I think that it nearly all soaks into the newer formations which I have described as pleistocene and pliocene, which overlies the whole of the western area in great patches. In some places you will find clay-beds and sand-beds 300 feet deep. The water gets into these beds.

1008. It would be found in basins here and there? Yes.

1009. At a lesser depth than the water which would be found in the proper basin? Yes. If you will look at the map which I have produced, you will see what I may call islands of primary rocks on the surface in different places. All around these islands the water would soak through into the lower basins.

1010. That is, that where permeable and impermeable strata meet the water would get through? Yes.

Run of water at the head of the Darling.

1011. Have you any idea as to whether, at the head of the Darling River, the water gets into the lower or the upper basin? I think that the greater quantity of it runs down into the river-beds—in the basin proper—the cretaceous beds.

1012.

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1012. But when the water is concentrated and gets into the main stream at flood-time, do you think much of it finds its way into the lower bed? No; I think that it gets into that bed only where it meets with the permeable strata at the edge of the cretaceous area.

1013. How do you account for the disappearance of the water in the Macquarie reed-beds? No doubt the water soaks through these, but the fact that the water does not soak through in this way in the Darling is shown by the mud-springs. The pressure below is so great as to force the water up.

Indication of presence of water.

1014. Have you any information as to the kind of timber which is generally found where water exists at no great distance from the surface? In such localities different varieties of gum-trees are usually found.

Gum-trees on alluvial flats.

1015. That would be where small basins are formed? Yes, in the Barrier country, in the valleys among the primary rocks, wherever there is an alluvial flat containing soakage water you will find gum-trees. The existence of these trees is generally an indication that there is soakage water underneath the surface—it is only in such places that trees grow in that country.

Maps showing permeability of strata.

1016. I suppose it would be possible to have a map prepared, showing in different colours the permeable and impermeable strata, and indicating the places where the water would be likely to get under the impermeable strata? Yes; approximately only, because the whole of the country has not been surveyed. I can illustrate the main features of the permeable and impermeable formations.

1017. *Mr. Franklin.*] We should like to have the information to guide us in any local examinations we may make? Any plan which I could prepare might be misleading in that respect—excepting as a general guide; as there has been no survey and as no levels have been taken, the lines which I might draw might be several miles out.

Suitable land for storage reservoirs.

1018. Is there any large area on the upper part of the tributaries of the Darling where the land is impermeable, and where storage reservoirs could be constructed? Wherever the older formations crop out at the surface the water would not soak into the ground.

Interception of water, and its effects on floods.

1019. Do you think it possible to intercept so much of the water by reservoirs on the upper watershed as to prevent sudden floods on the plains in the north-west? I do not think it possible.

1020. Not by extensive works? No. At Inverell, for instance, I have seen floods coming down the Macintyre which no reservoir which you could construct would resist; I have seen water running down nearly half a mile wide and 30 feet deep.

Impossibility of retaining water by reservoirs to prevent floods.

1021. Would it not be possible to retain the whole of that water by making cuts from the river to the creeks, and erecting dams in these so as to keep the water back? Floods might be mitigated very much by diverting the water into other valleys and damming it up in them, but I do not think it would be practicable by a system of reservoirs to retain the whole of the water which would run down the rivers at flood-time—that is at anything like a reasonable cost; in fact I believe that a system of dams such as you speak of would do more harm than good, because they would have the effect of flooding the country above, as is the case at Wagga.

Natural basins for reservoirs.

1022. *President.*] Of course if a system of artificial dams were agreed upon, the basins above would have to be given up to them: in that case would it be possible to find natural basins where we could store a large quantity of flood-water? I do not think so; the slopes of the dividing range falling to the rivers are very steep, and there are no large basins in which you could store water.

1023. *Mr. Townsend.*] It is simply a matter of capacity? Yes; the floods which do damage, I suppose send down a hundred times as much water as it would be possible to conserve in any reservoirs which you could construct. It would only be in the case of small floods that you could conserve the water.

Impracticability of storing water at the heads of the Macintyre, Macquarie, and Gwydir.

1024. *Mr. Franklin.*] Past experience has proved that at a time of heavy rain sufficient water is brought down all the tributaries of the Darling to flood large areas of country at varying depths; this water disappears in the ground—very little passes into the main river past Bourke—and it seems to us that the proper way would be to conserve a large quantity of water in the upper watershed, by damming the natural valleys and thus preventing a sudden rush of water lower down? In the lower portions of the country you might store large quantities of water, but I do not see how it could be done on the highest slopes of the range—at any rate in such a way as to prevent floods. Take the Macintyre, the Macquarie, and the Gwydir Rivers; I know of no place on the upper watersheds of these rivers where you could make sufficient reservoirs to check the flood-waters.

1025. *President.*] Have you been on the Upper Murray? I have been in the Tumut and Adelong district, on the Upper Murrumbidgee.

Features of the Macintyre country.

1026. Is the country on the Macintyre where you have been similar to that? It is very similar on the higher portions; but in places there are table-lands, and water comes off these table-lands, but there are no depressions; they are nearly all deep valleys, across which a number of weirs or dams will have to be constructed to intercept the water. There is no place where you could divert water into a natural basin such as Lake George.

Nature of soil on the Lower Darling.

1027. Do you think that the soil on the lower part of the Darling is sufficiently impermeable to carry water in canals? For a year or so perhaps the water might percolate through, but after that the sides of the canal would become puddled; then the water would not soak away.

Formation of plains in India.

1028. *Mr. Franklin.*] Have you seen the plains in India? No, but from what I have heard, I believe they are formed in the same manner as our plains in the interior; that is by floods washing *débris* from the high-lands.

Sandy beds rendered impermeable through flow of water.

1029. In India they dam the rivers and divert the water into canals, which are found to be perfectly impermeable after the first season: do you think that that would be the case here? I have known races to be cut through sandy soil, and after the water has been flowing through it for a year they have become practically impermeable. In the Riverina country the water soaks away from some of the tanks and dams during the first season. The plan sometimes adopted there is, when the water gets away in the dams, to turn a flock of sheep into them, and thus to puddle them. I think that a scheme of canalization is perfectly practicable.

Plains near Booligal.

1030. You think, then, that by a system of dams and canals, we might convey large quantities of water over areas which are now waterless? Yes, I think there is every facility for that kind of work, such as on the plains near Booligal. The water may be diverted from the rivers into old channels without any heavy engineering work being necessary.

1031. It has been done at Oxley Station, below Booligal: do you know of any depression like that on the upper parts of the river? No.

Slope of rivers above Bourke.

1032. Have you any plans showing the slopes of the river-beds above Bourke? There are no such plans that I am aware of. I remember that, in one of Sir Thomas Mitchell's works, he makes special reference

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to the general fall of the rivers on the dividing ranges. I cannot remember exactly what he states, but if the information will be of any value to you I will try to get it. I am afraid that the book was destroyed in the Garden Palace fire.

1033. Is the line of permeable country close to the watershed? It exists all along the flanks of the ranges.

1034. Would it be possible to intercept the water in soakage by mechanical means? I do not think so, because the outline of the country presents numerous jutting points, and it would take hundreds of miles of check dams to intercept the water.

Height above sea-level of outcrop of porous soil.

1035. *Mr. Townsend.*] Can you say approximately at what height above the sea-level the outcrop of the porous soil occurs? I think it occurs at about 500 to 1,000 feet, but it is not regular.

1036. *President.*] Do you know of any place on the river Darling where the bed of the river is higher than the plain on either side close to or within a reasonable distance of the river? I do not think that any sections have been taken, but it is very usual for river-beds through deltas to be much higher than the adjacent plains.

1037. Have you been on the Yanko? Yes.

1038. Have you examined the cutting there? No, it was not made at the time I examined that country.

Diversion of water from rivers into creeks.

1039. Do you think there are many places in the country where water may be diverted in the same way as it has been there? In many places a good deal of water could be diverted and stored as it has been done on the Yanko.

Impermeable coating of silt over river-beds.

1040. *Mr. Townsend.*] Do you not think that the silting which forms the impermeable skin over the river-beds rather militates against the idea of water soaking through the river-beds on to the impermeable strata? The water may not soak through in the actual channel of the river; but, as you know, in some places there are tributaries at intervals of about 100 yards, and where these occur the deposits in the river-beds must naturally be cut through.

Alluvial deposits on the Darling.

1041. Not along the Lower Darling? Certainly not; but some of the alluvial deposits on the Darling are so very sandy that the water must soak through. Mr. Russell, I think, states in one of his papers that wells sunk in the vicinity of the Darling are known to rise and fall as the river rises and falls.

Depth of sand in the mallee country between Hay and Wilcannia.

1042. *President.*] Have you examined the mallee country? Yes.

1043. Have you ascertained to what depth the sand goes? No, but I do not think it is very deep. It is chiefly blown sand. Between Hay and Wilcannia there are a number of sandy ridges, running north, east, and west, for miles, which have been blown there by the winds.

1044. I suppose that nearly all this sand rests on impermeable soil? I think so.

Old Man Plain.

1045. *Mr. Townsend.*] Have you been on the Old Man Plain? Yes.

1046. The clay there is impermeable, is it not? You get clay there, and in places it is covered with sand. I think all that country may be considered impermeable.

Increase of fall.

1047. *Mr. Franklin.*] Experience in India shows that the fall of tortuous rivers may be increased from 1 foot in the mile to 1 foot 6 inches by making direct cuts from the river parallel with its course; it is found that by making these cuts they get drainage from the natural deposits, and thus are enabled to bring the river-bed above the ground surface—in this way they irrigate very large areas of the adjacent country; it is also found there that the adjacent land is well adapted for canals, as it becomes almost impermeable after one season—Do you think it possible to find the same condition of things here? Yes, all through the low-lying country, because it is in this country where the deposits are of an alluvial nature that the rivers are most tortuous.

Coast range rocks.

1048. *Mr. Gipps.*] What is the age of the rocks of the coast range? As stated in my report, they are chiefly Silurian, Devonian, carboniferous, permian, secondary, granite, and volcanic.

Devonian rocks.

1049. Are the Devonian rocks of any thickness? In one place they have been proved to be 10,000 feet thick.

1050. Do you think that they would be of any great thickness in the western country? Yes.

Their porosity.

1051. Are they porous? Not as a rule. They are formed of quartzose sandstones, which are almost impermeable. They are much more compact than the Sydney sandstone.

Cretaceous beds at the surface at Silverton.

1052. At what level would the cretaceous rocks lie on the Devonian rocks? I have not made any calculations, but the only place where the cretaceous beds come to the surface is near Silverton. I have taken barometer levels, but I have not yet worked them out. I do not think they can be much more than 600 feet above the sea-level.

1053. At what height above the sea-level do the cretaceous rocks exist? About 600 feet.

1054. What is the average height above the sea-level of the old river-beds at their summit outcrops? What do you mean by outcrops?

1055. Where the rocks have been cut through? They have not been cut through in many places, but the rocks of the upper parts of the rivers are not unlike those which exist at Kiandra, which crop out at the side of the range.

Old river-beds.

1056. *Mr. Barton.*] Are there any surface indications which would guide us in finding these old river-beds in the formation of which you speak? The outcrop of the older formation might give some indication as to where the old river-beds exist.

1057. Do you know that the opinion is general among miners that you will find the deepest channels in the alluvial directly under the highest ridges of the floating basalt? I have noticed that myself in one place, but there it is purely local. The idea has arisen in the minds of the miners from the fact that they have traced deep leads under hills; but the continuation of the leads passes right under the river-channels also. The existence of these hills is purely accidental. From some cause or other they have not been denuded as the adjacent formation has been.

Fossil leaves and bones in old river-beds.

1058. *President.*] Fossils are found in these old river-beds, are they not? Fossil leaves and bones, which were deposited in the old river-beds before the lava has flowed over them. Fossils have been discovered in the deep leads at Gulgong.

Subterranean river at Gulgong.

1059. *Mr. Gipps.*] There is a supposed subterranean river at Gulgong—have you seen it? No; I know that in the deep lead at Gulgong there is so much water that miners have not been able to keep it down. That lead has been traced 10 miles further on, where it comes out to the surface, so that I cannot think that there is a subterranean river.

1060. Do you know anything about the shaft sunk close to the limestone formation there, in which the water has never been kept down, thus indicating that there must be a permanent stream? I suppose you refer to what is known as No. 44 shaft. The water in that shaft is soakage from the deep lead.

1061. It does not come from the limestone formation? No.

THURSDAY.

THURSDAY, 28 *AUGUST*, 1884.

Present:—

MR. BARTON, M.P.,	MR. LYNE, M.P.,
MR. DONKIN, J.P.,	MR. MURRAY, M.P.,
MR. GIPPS, C.E.,	MR. M'MORDIE, B.E.,

MR. TOWNSEND.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. E. O. Moriarty called in and examined:—

Mr. E. O. Moriarty. 28 Aug., 1884.

1062. *President.*] Your name is—? Edward Orpen Moriarty.

1063. What is your official designation? Engineer-in-Chief for Harbours and Rivers.

1064. You have occupied that position for many years, have you not? Yes.

1065. You have had considerable experience in connection with the rivers throughout the whole Colony? Yes, I have.

Surveys of Murray, Murrumbidgee, and Darling.

1066. Have you had prepared in your Department many sections of the rivers? I have had surveys made of the Murray, Murrumbidgee, and Darling, for the greater part of their length.

1067. Have we those surveys? Yes, I think so. Several surveys were burned in the fire at the Garden Palace, but all that were in my office were, I think, sent to you.

1068. What distance up the Darling did you have the surveys made? I think they go as far as Menindie.

1069. You have none as far as Bourke? Not a continuous survey from the lower end.

Test borings.

1070. In your Department have you had occasion to have test borings of the river-beds made? No, there have been no borings; there was no occasion for them, so far as I was concerned.

Water-supply of towns.

1071. You have also had considerable experience in connection with the water-supply of towns? Yes.

1072. In any case have you supplied towns with water by storage and by gravitation? The Sydney water-supply will be both by storage and gravitation. The supply to most country towns will be by pumping, but also by storage. We shall have to store water to tide over the dry seasons in most places.

Storage of water.

1073. In any experience you have had, do you think it would be possible to store large quantities of water at the heads of rivers, by taking advantage of natural basins? I have not made any examination of the rivers with that view. There is no doubt it could be done, but it would be an enormous expense.

1074. Have you had any experience of the water system of India? No, I have never been in India.

Irrigation.

1075. No doubt you are aware that they have gone to great expense there in connection with schemes for storing and distributing water for purposes of irrigation? Yes, I have read accounts of it in various books.

Unsuitability of the Indian scheme to this country.

1076. Do you think it would be practicable to carry out some such scheme here in connection with our rivers? No, I do not think it would; our rivers are totally different from the Indian rivers. For instance, there is no similarity between the Murray or Murrumbidgee and the Kistna, Collaroon, Godavery, and Ganges. I am simply telling you what I have read; I do not profess to know anything more than you could acquire by studying the works on the subject for yourselves.

Our river systems different from those of India.

1077. In what way do you consider that our river systems are entirely different from those of India? Well, the size of our rivers is insignificant in comparison with the size of Indian rivers. The dams on some of the rivers in India are a mile in length, and the rivers have sandy beds, which are quite different from the beds of our rivers.

Irrigation of the back lands.

1078. And is that your only reason for thinking that we cannot adopt such a system here—namely, that our rivers are smaller and do not carry such a body of water? I do not think it would be possible to throw the rivers over the adjoining lands in the same way as is done in India. I think that it may be done to some extent where there are anabranches which could be kept charged with water in ordinary seasons by a system of damming in the river, but as for irrigating the back lands I do not think it would be possible—I mean not financially possible.

Watering of the back country.

1079. Not financially possible? No; in India they have a teeming population, and all that is required to galvanize them into life is to give them plenty of water for their crops, but here we have no population to speak of. I think, however, that for pastoral purposes the back country might be much more permanently watered than it is at present.

Locking of the rivers.

1080. Do you think that might be done by a system of locking the rivers? Yes, but it should be done in connection with the navigation—I think the two things should be taken together.

1081. Then it would have to be done by a system of locking as well as damming? Yes, you would require the locks to enable the steamers and other vessels to pass.

1082. Do you not think that by a system of locking such rivers as the Murrumbidgee at opportune places where there are anabranches, natural watercourses, a great deal of water could be distributed over dry country? I have just said so; I think that might be done.

1083. In such places as Yanko would you stop navigation, or would you have a lock there? I would have a lock at all the weirs so that barges might get through. I think it is well worth while to keep up the navigation of those rivers.

Survey of the Murray and the Murrumbidgee.

1084. Have you been at the head of the Murrumbidgee or the Murray? I have not been above Albury. I have had the Murray surveyed from Albury to the junction of the Darling, and the Murrumbidgee surveyed from Gundagai to the junction of the Murray.

Snags.

1085. Are not surveys going on now? No, the operations we are carrying on now are for the removal of snags from the river-beds, snags that have been the accumulations of ages in those rivers. The first step in the improvement of any river is to take out the dead timber that has accumulated there, and as soon as the channel is clear we can proceed to lock it and construct weirs at suitable places.

Sections. Large scale surveys.

1086. In making the surveys that you have spoken of, have you taken sections of the river-beds? Yes, both longitudinal and cross sections, and in the large scale surveys all the obstructions in the river are shown, such as gravel-beds, fords, shallows, and so on. I sent the plans to the Commission. I may mention that some time ago there was a Company formed for improving the navigation of the Darling, and we sent tracings of the whole of our surveys to them as far as we had them.

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Information from water supplies for country towns.

1087. The whole of the information you could give us will be contained in those surveys? Yes.

1088. The water supply to country towns that you are carrying out would not I suppose assist us in any way in our inquiry, because the measurements would be simply local? Yes, most of the towns we are dealing with now—Bathurst, Goulburn, Wagga, and Albury—all have pumping schemes; the water is pumped from the river into reservoirs, and distributed from the reservoirs through the pipes.

1089. And the other works you have carried out have been principally on the coast? Yes, harbour works.

1090. *Mr. Donkin.*] Has any gravitation system been brought into operation here in connection with water supply except the Prospect scheme? No.

1091. I think you said the water supply in all the other places was provided by pumping? Yes.

Cost of water conservation by dams.

1092. You said you thought it would be very expensive to conserve water by means of large dams? Well, I have no surveys of the heads of our rivers, and it may be rash to express an opinion, but I believe the cost would be enormous.

Prospect dam.

1093. What is the cost of the Prospect dam? £400,000 or £500,000.

1094. And what is the capacity for storage? Ten thousand million gallons.

Places for dams at heads of rivers.

1095. I suppose any number of suitable places like Prospect could be found at the heads of rivers? I do not know about that, because Prospect is low down on the river. When you approach the heads of the rivers you meet with precipitous country, and it would require an enormous sum of money to construct dams there.

1096. That would not be the case at the head of the Darling, would it? No, the Darling of course rises in Queensland.

Storage of flood-waters.

1097. But it flows mostly through flat country? Away from the table-land it does; above that the country is precipitous. A somewhat similar plan was proposed to store the flood-waters in France, and it was found to be enormously costly. Besides that, there is a great deal of danger in constructing dams on the main watercourses themselves. In this country we are subject to such terrific floods that any dams which might be constructed would need to consist principally of solid masonry, in order to resist the flood-waters.

Watering of back country in India.

1098. I suppose that one reason why the system would be more expensive here than in India is that the price of labour is much higher here? Yes. As far as I am informed, the Indian dams are not constructed at the heads of rivers, but low down on the flat country, where the banks have a slight rise above the river-beds, and where the back country falls away from the banks of the river. The highest point is just immediately on the river-banks and the country falls away on each side, so that by backing the water at certain points and by the construction of canals you can water a large extent of country. I do not think that could be done on any of our rivers, because the banks are pretty high, and to construct dams that would raise the water to the level of the top of the bank would throw the whole of the flood-waters over the adjoining country. I do not think any dams in our rivers should be more than 5 or 6 feet high.

Impracticability of dams.

1099. Do you not think that, by a system of damming, the flood-waters might to a great extent be conserved? I do not think it is practicable at the present time; I do not think there is population or money enough for any useful scheme.

1100. Have you seen the Lachlan River? No.

Damming the Lachlan River.

1101. For over 100 miles the summer level is only something like 50 feet below the banks: do you think it would be possible to dam the river where the banks are 40 or 50 feet above the ordinary level—do you not think it would be possible to store water there? No doubt it would be possible, but I do not think it would be judicious.

Water-supply at Forbes.

1102. At Forbes, for instance, they have completed a scheme of water-supply at a cost of £7,000, but just when it was finished the river ceased to run, and they have had no water? Well, I think the proper course would be to have a succession of small dams on the river above the town.

Banks of the Lachlan.

1103. You have had no surveys made on the Lachlan? No, but I had a reconnaissance made of it some time ago. I should doubt, however, unless you are well assured of it, whether the banks can be so high as 50 feet.

1104. I am sure that at Forbes they are fully 50 feet, and also from Cowra to Hillston? Well, you would have to pump the water from the river over plains.

Levels and cross-sections of rivers.

1105. In making the surveys you spoke of on the Murray, Murrumbidgee, and Darling, I suppose that levels were taken, but were any cross-sections made? On the Murray they were made every mile, and on the large plans, as I have said, all the obstructions are shown.

Gauging the rivers.

1106. Have you had any system of gauging the rivers? Yes; I established a system some years ago. I had a form prepared, and sent it to various persons in the interior, with a request that they would supply the information. This was kept up for some years, but of late we have found we could not get any returns.

1107. Do you think it would be advisable to have such a system of gauges established? They are used in some places. On the river Murray, at Albury, for instance, and at Echuca and some other places, there is a record published of the height of the river every morning in the local paper. That is a very useful plan.

Gauges above Bourke.

1108. I think there are no stations on the Darling above Bourke? I sent some forms of returns to the various owners of stations, with a request that they should be filled up so as to record the height of the water on a gauge every Sunday. I selected Sunday as being an idle day, and I got a great deal of abuse for the suggestion.

Gauges on bridges.

1109. *Mr. Barton.*] I think we have heard that you had gauges fixed on the different bridges that cross the rivers? No; but flood-levels are marked on all our plans.

1110. Yes; but I mean gauges for showing the height of the river at different places? We had gauges fixed on different parts of the rivers, but they have fallen into disuse of late years—I could not get the people to give me a return.

Discharge of rivers.

1111. Have you taken any means to ascertain the quantity of water that flows down the rivers at different times? That could be ascertained from our plans. Of course the water flows in a constantly varying quantity—there is scarcely ever the same quantity for two consecutive months. It is very easy to compute the quantity of water in times of flood, from the levels on our plans.

1112. You have no knowledge yourself of the matter—your information is obtained from the officers of your Department? Which information?

1113. The information as to the quantity of water that flows down the rivers at times of flood or half-flood? That knowledge can be obtained by taking the levels between two known points; then, having the cross-sections of the river, you can compute the velocity and quantity of water at each. That can be done from the plans.

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1114. I understood you to say that the cross-sections were lost? Some were lost, but I cannot tell what they were. Mr. Gipps tells me that you did not apply for the cross-sections, so they may be in my office now. From the cross-sections and from the flood-levels you can compute the quantity of water that passes down the river-bed. We have exact levels at certain stated points, and we know the exact fall of water between those points.

Water escaping underground.

1115. I understand that perfectly well, but there is a notion that a very great proportion of water escapes underground, and that, taking two given points—say so many miles apart—there would be less water flowing at one point than at the other: I wished to know whether you had any data showing anything of the sort? I do not think that can be the case. I think that nearly all the water not thrown over the banks of the river passes down through the channel. Of course there is a great deal of waste water. I remember on one occasion going up the Murray in time of flood. We stopped to take in wood, and I saw that the man who was supplying us with wood had his whole family camped in the dray on the river bank. The water was up about 4 feet, and the dray was just a few inches above the water. The flood extended for about 10 miles on each side of the river. Of course a great deal of water would be lost from the channel in such a case as that. I am told that the Darling on one occasion was nearly 60 miles wide between the flood-marks on each side of the river at its junction with the Murrumbidgee—in fact it was like an inland sea.

Waste of water.

Width of Darling flood.

Victorian system of Water Trusts.

1116. *Mr. Murray.*] I suppose you are acquainted with the Victorian system of Water Trusts or Shire Councils? I have a slight knowledge of them.

1117. Do you think it is possible for us to adopt that system here? I do not know. There would be some difficulty about it, because the persons who would be called upon to pay for the works would not be the only persons benefited. Suppose you adopt a Dutch system of water conservation; any works that might be undertaken would not only benefit a certain class of people, but would also in a very much larger degree benefit the Crown Lands in the neighbourhood. Therefore the Crown should pay a very large proportion of the cost of such works. The question is, whether we are in a sufficiently advanced state to justify the Government in handing over to Shire Councils the large sums of money that would be required to carry out any general system of irrigation. I think not; but I think it would be a very good thing if the Government were relieved of a great deal of the work now thrown upon them. I think, for instance, that the water supply to country towns ought to be carried out by the local Municipalities, and that the Government should be relieved from the duty of carrying them out.

1118. *President.*] That cannot very well be done until there is an extended system of local government? I suppose not, but I think it is high time something of the kind were done.

System of levying rates.

1119. *Mr. Murray.*] Is it not possible to adopt such a system as they have in Ireland, where they levy a rate in proportion to the extent to which the land is improved by draining or the conservation of water? That is all very well with regard to drainage, but I do not think you could conserve water to any extent here. In Ireland there are no works nor any local bodies entrusted with the duties of conserving water in the country districts. I think the population is too scant to warrant the undertaking of any large works for that purpose—the time has not arrived for it, in my opinion.

Water conserving scheme.

Velocity and discharge of rivers.

1120. You stated that we had in the plans before us sufficient data upon which to calculate the velocity of the rivers: is the velocity not affected very much by the quantity of water that passes down the river-bed, and by the tortuous or straight course of the rivers, as well as by the levels? If you want to calculate the discharge, you would of course select a suitable part of the river where the channel is tolerably uniform and straight, and then taking the differences of level at two points you can calculate the mean discharge at those points, and you know it must be pretty much the same both above and below unless there are some large tributaries flowing in between these places. An Adelaide gentleman who reported on the lower Murray adopted a very original method of calculating the difference of levels. He found that the water travelled at a certain velocity in one part, and he computed the difference of level from the velocity of the water, which was of course absurd, as although the velocity would vary with the state of the river in times of flood, and would therefore, if adopted as the basis of calculation, give different results, the actual difference of level must remain constant. But I have had all the rivers absolutely levelled. We levelled from Albury to the junction of the Darling on the Murray. We levelled across from Albury to Wagga by the road; we levelled from Wagga down to the junction of the Murrumbidgee, and we got the railway levels from Melbourne to Albury, and from Wagga to Albury to Sydney, and again we got the levels from Echuca to Melbourne, so that we had several checks.

Levels of Darling, Murray, and Murrumbidgee.

1121. Have we those sections? I do not know, but they could be supplied if you have not.

1122. But you do not think we are ripe for such a system as has been adopted in Victoria? Well, I do not know that it has been adopted in Victoria.

1123. Oh yes it has? Well, our Colony is so large and the population so scant, that I think it would be better to make a beginning with the towns by making them provide their own local water-works.

Effect of improvement of water supply.

1124. *Mr. M'Mordie.*] Do you not think that if something were done to improve the water supply in the back country an increase of population would likely follow? I do not know. A great deal would depend on the amount of money voted every year for immigration. I think the principal advantage of improving the water supply in the back country would be to the squatters and others who are using the land for pastoral purposes. They do not however want a great supply of water. I do not know whether that part of the country is fit for agriculture—I am inclined to think that it is not.

1125. *President.*] But if by a system of water conservation it could be shown that that part of the country is more fitted for agriculture than it is supposed to be now, it would increase the stream of population in that direction? Well, it might; and if you conserve the water at the heads of the rivers, you could easily understand how even a very large reservoir would make very little show on the rivers in times of drought. The project of constructing reservoirs would be such a gigantic one that I do not think we could undertake it in our present circumstances. Just consider the channel of the Murray from Albury down, and suppose that had to be filled in a dry season sufficiently high to throw the water over the back country—see what a large reservoir would be required.

Diversion of water from rivers.

1126. But I do not mean that the water should be sent down the channel of the river, but that it should be taken from the river by means of canals? Then you would have to go into an expensive system of canals. It may be that the channel of the river would be the best canal to use.

1127. It may be, but in some cases it would lie too low? Well, I think that works of that kind on any large scale would entail an enormous cost.

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1128. *Mr. Townsend.*] Have you noticed any scouring away of the rivers? Of course there is a certain alteration going on in all the beds of the rivers. We often find trees falling down, but I do not think that is of much importance.

Erosion and alteration of the river beds.

1129. Have you noticed any distinct alteration of channel during excessive floods? No; occasionally, where there is a long promontory with a very narrow neck I have known the river to make its way through, but generally speaking the river keeps to its bank.

1130. I was referring more particularly to the Darling, and to the observations your officers have been making on that river? I have never been on the Darling, but I do not think the matter you speak of is of very serious importance.

Railway embankments.

1131. *Mr. Donkin.*] Could we not make use of the same plan which has been adopted in Queensland, to utilize railway embankments for the conservation of water? If I had anything to do with the railway I should not allow you to make a dam of an embankment. Suppose the embankment were to be washed away and the train wrecked. That is a very foolish thing to do, in my opinion. I do not think you would get Mr. Whitton to sanction the use of his railway embankments for dams.

Use of anabranches.

1132. I think you said that the only way in which you thought water could be conserved, or at least distributed, was by making use of the anabranches? I think the first thing that should be done is to utilize all the anabranches as distributing channels.

Yanko Creek.

1133. For instance, as Yanko Creek carries the water from the Murrumbidgee? Yes. There are several channels, some leading into lakes on the Darling; they might be extensively used I think, and the cost would not be very great, because there would be no difficulty in constructing weirs in the rivers with locks for the vessels to pass.

Cost of impounding of water.

1134. Do you think that on a large scale the impounding of the waters at the head of rivers would not be a financial success at the present time? I am certain it would not—the cost would be something enormous. See what we have to pay for a single dam for the Sydney water supply.

1135. Half a million, is it not? Yes, and it is a dam constructed in a safe position, where there is no danger of a flood hurting it; but if you construct a dam across a river, you would have an enormous body of water to deal with, and you would require solid masonry.

Cost of labour in India.

1136. Do you know the difference in cost between embankments and chanel cuttings with regard to India and this country? I think in India the cost is about 1½d. or 2d. a yard, whereas the canal cuttings for the Sydney water supply cost about 2s. 11d. or 3s. per yard, or about ten or twelve times as much as in India. I believe that in India the proportion of the population is about 600 to the square mile. Here we have about 0·6 square mile to the inhabitant, or something like that. I should like to mention one thing, namely, that I think we are going to work in the right way in what we are doing towards clearing the river-beds of the snags. Whatever is to be done in these rivers should not be attempted until the natural channel is clear, and you could not clear them if you raised the water against yourselves. That we are doing now and have been doing for many years. We find that on the Darling the cost of clearing is somewhere about £45 a mile, including the pulling up and burning of the snags. On the Murray and Murrumbidgee the cost varies from £45 to £60 per mile, according to the locality. In some places there was a network of timber when we commenced operations. This is the first work that must be undertaken in any attempt to improve our rivers.

Clearing of river-beds of the snags.

1137. *Mr. Murray.*] How many miles in the year can you clear? We do about 12 miles a month on the Darling, and on the Murrumbidgee which is very heavily timbered, we do about 5 miles a month.

1138. *Mr. Barton.*] And are you clearing the timber from the banks so that it will not fall into the river? No, only where the timber is likely to fall in immediately.

1139. *President.*] And the trees that you pull down, do you leave them on the bank? We stack them on the bank, and when they are dry we burn them. On two or three occasions the piles of timber have been swept back into the river by unexpected floods, but we find that it is no use trying to burn timber until it has had the December sun upon it.

The rivers as feeders to railways.

1140. That work has reference principally to the navigation of the river, but it would not apply so much to irrigation purposes? No, but I think the matter should be considered in regard to navigation as well as irrigation. I should not like to see the rivers blocked for the purposes of navigation, because they are certain to be good feeders to the railways.

1141. The snagging is principally to ensure future navigation of the rivers? Yes.

1142. *Mr. Donkin.*] How do you find out the position of the snags? We can see them.

Clearing of snags by steam winch.

1143. Do you take them all out from the river-beds? Yes; we have a steam winch in a barge, and we make the tackling fast to a standing tree and one end of the fall fast to the log in the river. Then we bring the other end of the fall to the steam winch on the barge, and pull the log on to the river bank, where it is left to dry, and is ultimately burned.

Effect of the clearing on navigation.

1144. Then, as a matter of fact, until the river was cleared to some extent navigation was almost impracticable in the Murrumbidgee and Murray? It was, except at a very high state of the river, but since we have been at work we find that vessels can go up the river with 3 or 4 feet less water in it than than they used to be able to do in times past. They can also travel at night, which they were unable to do before.

1145. *President.*] The Murray is snagged for nearly its whole length, is it not? I do not think it has been entirely done, but a very large portion of it has. We have ceased our operations on the Murray, and are confining our attention to the Murrumbidgee and the Darling.

1146. But the Murrumbidgee and the Darling have been roughly snagged before, have they not, because steamers have gone up them for a long time? Yes, but they used to go up when the river was in flood. The rivers have not been snagged throughout, but they have been greatly improved in most of the bad places.

Rock impediments in the Darling.

1147. *Mr. Barton.*] Are there any rock impediments in the way of navigation in the Darling that could be removed at no very considerable expense? There are some rocky bars which we purpose removing. We have had them surveyed, and all the details of the work ready to commence.

1148. *President.*] The surveys have been made by officers in your Department? Yes, they have been made under my Department.

THURSDAY,

THURSDAY, 4 SEPTEMBER, 1884.

Present.—

Mr. BARTON, M.P., | Mr. GIPPS, C.E.,
Mr. DONKIN, J.P., | Mr. LYNE, M.P.,
Mr. FRANKLIN, C.E., | Mr. MURRAY, M.P.,
Mr. M'MORDIE, B.E.

W. J. LYNE, Esq., M.P., President, in the Chair.

Mr. Wm. Christopher Bennett called in and examined:—

1149. *President.*] You are Commissioner for Roads and a civil engineer? Yes.

1150. You have made the question of water supply in this Colony a study, have you not? I have given it a good deal of attention. The supply from rivers has hardly formed part of my duty, but the supply from tanks and wells has. Mr. W. C. Bennett. 4 Sept., 1884.

1151. But you have taken great interest in the question? Yes.

1152. Have you not written some papers or some reports in reference to water supply for certain parts of the country? No, I do not think I ever wrote anything more than ordinary minutes with reference to tanks and wells, but eighteen years ago I gave some evidence before the Deniliquin and Moama Railway Committee, which evidence is published in the Votes and Proceedings of Parliament. (*Appendix* G 1.)

1153. In your Department you have had a good deal to do with the construction of tanks, I think, have you not? Yes, I have.

1154. Have you had anything to do with the sinking of wells in any part of the country? Yes, and we have still, but not artesian wells.

1155. Wells for what purpose? Ordinary wells for water supply on stock routes.

1156. Have you had any experience outside the Colony on the water question? Yes, all my early days were spent in works connected with water, drainage of rivers, the improvement of navigation, and mill-power, in Ireland. I was brought up in the Department of Public Works, and was there seven years. Then I had some work to do in connection with the navigation of the Magdalena River in South America. I was sent there on the recommendation of Sir Harry Jones, who was Chairman of the Commission in Ireland. After that I was offered sole charge of the English portion of the international survey of the Darien ship canal. I went out there to take charge on the Pacific side, and completed the work entrusted to me.

1157. Have you studied the river systems of this Colony? Yes, I have given the subject a good deal of attention, but not officially.

1158. Which systems in particular? I cannot say that I have given attention to one more than another, but perhaps the one that I thought most suited for the purpose was the Murray.

1159. Have you ever been to the head of the Murray? No, not to the head of it; I have been up as far as Maracket.

1160. From Albury upwards do you consider it would be possible to conserve or divert any quantity of water? I think it would be possible to divert a considerable quantity of water above Maracket. Diversion of water from the Murray.

1161. In what direction? Well, the exact mode of doing it would of course be determined by the levels; it would have to be done by a canal.

1162. Would you put a dam or a weir across the river? Oh yes.

1163. And in which direction would you divert the water? If the fall would admit, I would take it from the summit of the Murray to near the Billabong, and water each side as far as the water allowed. Diversion to the Billabong by canal and tunnel.

1164. Conveying it, when you got it in that direction, by a canal? Yes; it is possible, in fact certain, that you would have to make a tunnel. It might be more expensive than it is worth, but I do not think so.

1165. Supposing a scheme of that kind to be carried out, what would be approximately the extent of country that would be benefited? That would altogether depend on the available water. If you had water enough, you could irrigate the whole country down to Deniliquin. Extent of benefited country.

1166. I do not refer so much to irrigation as to water supply? Well you could supply water to the whole country, as far as the levels are concerned.

1167. That would be between the Billabong and the Murray? Yes.

1168. As far as Deniliquin? Yes, or possibly further.

1169. Did you observe any places on the Upper Murray where large quantities of water could be stored without diverting it in the way you speak of? It would be wrong to say that I had observed such places, but I have no doubt they exist and could be found by examination. Places for storage of water on the Upper Murray.

1170. Have you been to the head of the Murrumbidgee at all? Yes, I have been close to the head of the Murrumbidgee at Cooma.

1171. Are the features of that river similar to those of the Murray? No; the course of the Murrumbidgee is very much more circuitous, and the country is rougher, but still the Murrumbidgee might also be worth examination—that is instrumental examination. Of course no man can speak with any degree of accuracy until the instruments have been over the country. Features of the Murrumbidgee.

1172. Do you know of any other point on the Murray lower down, nearer Albury, where you are of opinion that water might be diverted? Mr. Gordon was speaking to me of some places at Tuppall, and I have no doubt that what he said was right, but a difficulty that occurs to me in dealing with the lower part of the river is, that unless you have an expensive movable dam, either automatic or otherwise, an ordinary weir will induce floods, as well as cause great expense in securing the sides from scour. Difficulty of diverting water from the Murray near Albury.

1173. You say an ordinary weir will induce floods? Yes, by raising the level, if you have it high enough. I think it desirable, therefore, if possible, to take the water out of the river where you have rocky or hard foundations, as you have in the Upper Murray. At the same time I have no doubt that what Mr. Gordon says is the case,—a very inexpensive scheme could be devised at Tuppall. Effect of weirs on floods. Diversion at Tuppall.

1174. Have you had any experience, or are you fully acquainted with the system of irrigation in India? As far as any man can be acquainted with a thing without seeing it, I am; but I have never seen it.

1175. Do you think the system carried out there would be at all applicable here? It is rather expensive; you would have to begin tentatively here, and on a smaller scale.

1176.

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1176. Do you think any general system of irrigation could be carried out here in a practicable and payable manner? It must be slow and tentative. It would be wrong to go rashly at it, but ultimately I have no doubt it will be indispensable to the profitable occupation of the country.

Irrigation. Rainfall.

1177. Do you think the rainfall of the Colony is sufficient to irrigate to any large extent? Not to irrigate the whole country broadly, but parts.

1178. But to any appreciable extent? Yes, I do; and you could greatly increase the extent by means of reservoirs if you found it pay, as I have no doubt it would.

1179. Have you been inland on the Darling at all? No.

The Darling country.

1180. Do you know much of the Darling? I never saw the Darling, except at Wentworth, but I know tolerably well, as far as a man can without seeing for himself, what the country is like, from the reports of officers, and from having works done there.

Wells.

1181. In your Department, has the sinking of wells in the far western country come much under your notice? Yes, ordinary wells—not artesian wells.

1182. Wells for stock purposes on travelling stock routes? Yes

Underground supply.

1183. And what is your opinion in reference to the underground supply of water obtainable in that part of the country—do you think there is an inexhaustible supply? Oh no.

1184. In any wells that you have sunk, have you any idea of the quantity of water? Like any other well that you sink into a permeable stratum, the well forms a crater round it, and the base of that will be in proportion to the depth of the well and the quantity drawn away from it.

1185. And have any wells that have come within your knowledge been tested to their utmost? A great many of them; we frequently test them to exhaustion.

1186. And they produce a good supply of water? They produce enough for the purpose required, but not an inexhaustible supply by any means.

Water conservation and distribution by Government or local bodies.

1187. In carrying out a system of water conservation and distribution, do you consider that it should be done by the Government in the first instance, or by local bodies? That depends on who may have to pay for it. If you tax the local people, I think they ought to have some voice in the works.

1188. But do you consider that it is possible or practicable to carry out any system before the Colony has been divided under a system of local government? Well, the purposes are so very distinct that even in England they find it necessary to separate the dealing with rivers from the ordinary local government, and they generally now have a body to deal with each catchment, entirely irrespective of other local subdivisions.

Water Trusts.

1189. *Mr. Gipps.*] They call them Trusts, do they not? Yes, Water Trusts; and they have sole control over each catchment. It would be very awkward if one-half of the river were under the control of one person, and another part under the control of another person.

1190 *President.*] That would then be carrying out the scheme by local bodies? Yes, by extended local bodies.

1191. It would be by the general government, irrespective of local government? There would have to be a large amount of general government intervention in the first instance, at all events, I think.

The water supply question with regard to local government.

1192. Then are you of opinion that any general system or scheme for the Colony of New South Wales could be carried out before the Colony has been subdivided, as Victoria has been, into local Shires and Boroughs? I do not think there is any connection between the two things at all; I think the water supply is so important and so different that it must be disconnected from any merely local government. Whatever body is to deal with a river must have control over it from its source to the point at which your irrigation operations commence.

1193. That would be, I presume, for the purpose of dealing with the watershed right through, so that no other interest would come in? Yes; but you will find interests enough arising in any mode of dealing with the subject.

Resumption of land above the dams.

1194. In making weirs or dams across the heads of any rivers where a large quantity of water is thrown back, do you consider it would be wise to resume the land above that point where it would be liable to flood? I think that would be unnecessary. You could make the barrage so as to prevent floods.

1195. But if you are going to conserve any large quantity of water I mean? If you are going to make anything permanent, such as a reservoir, of course you must resume the land.

1196. The whole country that would be affected? No, only the portion submerged.

1197. *Mr. Donkin.*] Do you know the Billabong Creek, that is where the Yanko cutting is made? Yes, I do.

Diversion into the Billabong.

1198. Was it your suggestion that the weir should be made at Maracket, above Albury, on the Murray, to divert the water into the Billabong? No, to divert the water into the Billabong at Ten-mile Creek. I did not suggest any particular point—I suggested that the country should be examined in order to find the best point.

Position of the Billabong.

1199. The main Billabong is about midway between the Murray and the Murrumbidgee? Yes, nearly on the summit.

1200. But the Murrumbidgee is not sufficient to keep it in stream? The Murrumbidgee has access to it only at certain periods. The Billabong occupies with respect to these two rivers a similar position to that which the Ganges Canal occupies between the Ganges and the Jumna.

1201. Do you not think the water of the Murray could be diverted into the Billabong? I have said so.

Height of weirs.

1202. You were speaking of weirs across the river being automatic—what height would you advise? That would depend altogether on the circumstances of the case, the quantity of water you wanted to divert, the country it was to be distributed over, whether it would be worth while to make a large weir in order to save excavation, and fifty other considerations.

1203. Did you take into account at Cooma the quantity of snow-water passing down? I did not see any. At that time there was very little water in the Murrumbidgee.

Action of snow.

1204. The snow affects the discharge? Yes, and still more on the Murray. The snow acts as a reservoir.

1205. You said the tanks and wells were under your direction? Partially—I have not sole control.

Utility of tanks or wells.

1206. Which do you prefer as a means of providing water for stock, tanks or wells? The tank is best in some places, the well in others. I think that on the other side of the Darling wells are the best. It all depends on rainfall and whether there is water. At a depth of 150 feet you can get salt water almost anywhere, but that of course will not do for stock.

Success of irrigation.

1207. Do you think irrigation in New South Wales would ever be a financial success? Not *per se* at first,

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first, but it would be in this way: that it would enable the squatters or the occupants of the land, whether squatters or selectors, during periods of drought, to have lucerne paddocks to prevent their stock from starving. That is the first use I would look to. After that you would find the people gradually extending its use to the limit of the water, which is the only limit. I have no doubt they would ultimately find it to their advantage to put reservoirs at the heads of the rivers; and if you look at the evidence given before the Hunter River Flood Commission, of which I was a member, you will find that a great many of my questions had reference to the establishment of reservoirs at the head of the river, for the immediate receipt and gradual discharge of the water, thereby mitigating the floods. There was a large scheme proposed by Mr. Ellett for the Ohio, but I found just at that time that flood after flood came into the Hunter River, so that it was evident that the amount of reservoirage that was necessary to have any appreciable effect would be almost impossible to provide. The converse of that, however—the necessity for providing water by means of reservoirs in dry seasons—is altogether another question.

Hunter River Flood Commission.

1208. You think then that in any scheme for the conservation of water in this Colony each catchment area should be taken separately? Yes, that will be admitted by any one.

Conservations in each catchment area.

1209. What means do you adopt for sinking wells? The ordinary mining prospector's shaft. We had a boring apparatus many years ago, and sank wells to a depth of 200 feet, but we found that the ordinary prospecting shaft was the best. The transport of the boring apparatus and all water required our having a lot of men directly in our employment, and we found that the rough miner's shaft serves the purpose much better.

Apparatus for sinking wells.

1210. *Mr. Barton.*] Is that evidence you spoke of as taken by the Hunter River Commission available? Yes, you can get it from the Government Printer. It is only by carefully reading my questions that you will find the drift of them.

1211. *Mr. M'Mordie.*] What districts would you recommend for the preliminary survey in order to see what can be done in the way of water conservation? You might take the Murray, above Albury. I would level up the country, beginning where there was a reasonable fall, and trying for a narrow place in the range. The Murrumbidgee ought also to be examined, at a point perhaps a little above Queanbeyan, though I do not know the place sufficiently to localize it. It should, however, be at a height sufficient to enable you to convey water across to Cootamundra if it is possible; though I do not assert that it is possible. You might also examine the Macquarie, but the quantity of water in that river is so small as to be hardly worth the trouble. A subsidiary supply to the Murrumbidgee might be got from the Lachlan. The Peel and the M'Donald Rivers, perhaps also the Severn, and indeed the heads of all our rivers, might be examined.

Districts to be first surveyed.

1212. In sinking tanks for stock purposes, what slopes have you adopted for the excavation? 1½ to 1.

Slopes of tanks.

1213. Have such slopes been found too steep to stand, and unsuitable for the purpose? I have not heard any complaints where proper care has been taken. In some places where the water was let in or came in with a rush there has been some little damage, but that has been beyond our control.

1214. Would it on general grounds be objectionable to adopt flatter slopes, as 3 to 1 or 5 to 1? Yes, it would, because the evaporation is so great. Mr. Greig, of Fowler & Co., found great fault with our slopes, because they would not permit of his machinery being used to advantage. I told him we would adopt any slopes he wished, so that he might try what he could do, and he is now excavating a tank up near Nymagee. But what he then proposed was to leave the two ends open, with embankments at the side, so that all the spoil is lost.

1215. Would you approve of planting trees on embankments made for holding in water? Certainly not.

Trees on embankments.

1216. You would not think that an improvement? No.

1217. *Mr. Franklin.*] Are you acquainted with the river diversion carried out in Victoria by Mr. Gordon? Mr. Gordon sent me his reports; that is all I know about it, excepting that I have also had conversations with him on the subject.

1218. You do not think it would be advisable to plant trees around large dams in the interior? Not in dams which are intended to hold water, because their roots would penetrate the bank and make leakage places.

1219. In India they plant trees very extensively? But the banks there are not intended to hold water, and the trees are planted for shade.

1220. On the canal banks they are still planting trees? They may, but are the banks not merely spoil banks?—In that case the trees are used to prevent evaporation, and the banks are not made to hold water.

1221. *Mr. Murray.*] Have you any sections of the wells sunk by your Department? No; we have on record all the depths and the kind of material, but not the sections, because there was no use in preparing them. We can prepare them, however, if it is desired.

Records of depth and material of wells.

1222. You can show the strata if necessary? Yes.

1223. And plans showing the position of different wells? Yes, but we have not connected them by levels.

1224. Do they give a record of the strata passed through? Yes.

1225. And what wells contain fresh and what salt water? Yes, we can compile all that information by searching the records.

1226. Have you made any report recommending the best system of conserving water at the heads of our rivers or otherwise? No, I have never been officially called upon to do so.

1227. You think it would be necessary to have a complete examination of the country and a survey made before any system could be decided upon? Yes, I think that the first thing to do is to measure the water—the minimum supplies of water all over the country. Most valuable information may be obtained in that way. The next thing would be to show on a good plan the lines of equal rainfall, and then to compile all the railway levels and road levels. Then you would be in a better position to feel your way as to the course that should be taken.

Necessity of examining the country.

1228. Would there be any difficulty in establishing observations? No, I do not think there would; but whatever difficulty there may be it must be overcome.

Difficulty of observations.

1229. Could not your superintendents undertake that work? No; I think they have too much to do already, and many are not fitted for such delicate observation.

1230. *Mr. Gipps.*] How do you think the water supply of the different river systems could be most profitably applied—to irrigation, motive power, or navigation? In a country where coal is so cheap as it is here, I think motive power is out of the question, and as to navigation, if good permanent navigation can be established I say yes; but navigation in our rivers is so desultory and difficult. It is possible

Most profitable application of the river waters.

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one year and for three years it is impossible. A railway will carry much more surely and nearly as cheaply. It would be a different matter if you had large quantities of heavy material to transport, such as coal or iron ore, but for anything which can be carried by rail, railways are the best. I think the proper function of rivers here is to supply water.

Diversion of Murrumbidgee to Lake George.

1231. Do you think it would be possible to divert the Murrumbidgee at Basin Creek, 2,600 feet to the level of (say) Lake George, 2,300 feet? I do not, because the country around Lake George is not precipitous, but rather sloping.

1232. If you take a point high enough on the Murrumbidgee it could be done: if it could be done would you recommend it? No, I do not think I would. I do not see of what advantage it would be. It might be possible to do it, but the question is, could you get a sufficiently *deep* supply in Lake George, because we know it is dry sometimes. Whatever reservoir might be established should be very deep indeed, so as to expose as little of the surface as possible to evaporation.

1233. Could it not be done by making two impounding banks? It is possible. Of course it is a matter for investigation. I should prefer some lateral valleys of the rivers.

Cross sections of Darling.

1234. Have you any cross sections of the Darling about Bourke? We have them at Bourke and Brewarrina for bridges—that is all.

1235. *Mr. Barton.*] Have you none above Brewarrina? We have at Walgett, but I do not call the river the Darling there.

1236. *Mr. Gipps.*] Have you ever estimated the quantity of the water flowing down the river at Bourke? No.

Use of wind-power.

1237. Do you think it would be advisable to use wind-power as much as possible? Yes.

1238. In which way—directly, or by means of compressed air? It depends on what you want it for.

1239. Do you think the wind in the interior would be regular enough to be depended upon absolutely? It might if you had a sufficiently large reservoir. For instance, we are putting up a windmill at Lignum Hut, on the road from Hay to Wilcannia. A larger reservoir is required there than elsewhere, but it would be very expensive to apply wind-power—that is, by the compression of air—so as to ensure permanence.

1240. You do not think it would be advisable? Not commercially advisable.

The question of navigation.

1241. *Mr. M'Mordie.*] I understand from your evidence that you consider the question of river navigation secondary to that of water supply? Entirely secondary. The navigation of the rivers will be superseded in a few years by railways. The money expended on our rivers has been attended with valuable results, because hitherto there was no other means of getting produce to market; but in future I think that the rivers will be utilized for the purpose of water supply, and in producing something to transport rather than in transporting it.

1242. If one or the other is to be sacrificed you would sacrifice navigation? Yes.

1243. *President.*] But throwing weirs across rivers and also locking them would not prevent navigation? Locking, of course, makes provision for navigation; but a weir must stop navigation, if it is to be efficient. On the rivers in America, especially where there is any large amount of water, there is an opening for navigation, and boats shoot the passage; but here you have not water enough.

The action of floods on locks and river courses.

1244. But with a lock, navigation could still be kept up? Yes; but there is one matter in connection with our rivers which people have not considered, and that is the great range of floods in the rivers. If you have a lock that is of any use in ordinary weather, unless you go to great expense in building walls above flood-level, they must be submerged during floods and be exposed to injury. You might have a new river-course made by the first flood. It would be necessary to put locks and weirs at particular points where you could dominate the whole flood-line, otherwise you would have—what I have no doubt gentlemen acquainted with our rivers have seen on a small scale—your dam outflanked.

1245. Would not the same thing occur in India? No; the flood range is not so great in India. The flood operates to a greater depth in the sandy beds of the rivers, but the difference between the high and low waters is not so great, and the locks in India are all on canals or branches of canals.

Diversion of water from Murray above Albury.

1246. I think I understood you to say that it would be practicable to divert a portion of the Murray River from somewhere above Albury, near Maracket? I do not say above Maracket, but wherever the levels show it to be desirable.

1247. And take it down through the dry country between the Murray and the Murrumbidgee? Yes.

Its effect on the necessity of tanks.

1248. If that were done, a system of tanks in the neighbourhood of the canal by which the water is conveyed might easily be made, I presume, and the water conveyed into them? I think it would hardly be necessary.

1249. But still it would be possible? It would be possible.

1250. At the present time there are numerous tanks being made, and many others have been applied for in that part of the country? There are, under a sort of protest from me that the other thing would be better, which protest was to a certain extent overruled.

1251. But if the water was conveyed from the Upper Murray to the neighbourhood of these tanks, a good supply could always be got by diverting a portion of the water from the canal? Yes, but if the water was in the canal you would not want it in the tanks.

1252. But I am supposing the canal a few miles away from the tanks and that the levels are favourable? Oh yes.

Diversion from the Murrumbidgee.

1253. I think you also suggested that the water from the Murrumbidgee might be diverted and taken through that dry country somewhere in the neighbourhood of Cootamundra and down towards Temora? Yes, the Upper Murrumbidgee.

1254. And on I suppose towards the junction with the lower Murrumbidgee, or to the junction with the Lachlan? As far as the water would carry it. It is impossible to say, because there might not be water enough to go half the way. If there was much use for it, it would not.

Supply from the Abercrombie ranges.

1255. I think you said also that a supply of water might be obtained from the heads of the Lachlan and along that river? Yes; in the Abercrombie ranges suitable places might be found for reservoirs or even for living water.

1256. And the same might be done, I think you said, to a limited extent, at the head of the Macquarie? A very limited extent. The Fish River is very small.

Effect of any such scheme on the dry country

1257. Supposing that a scheme of that kind were carried out, would it not to your knowledge open up a large extent of country now very dry? It would not open it up, because it is opened up already.

1258. But it would enable it to be better utilized? Certainly; but there are gentlemen here who can speak on that subject much better than I can.

1259.

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1259. It would also save a large expenditure now being incurred for dams and tanks, would it not. It would.

1260. And the supply would be far more certain? Yes.

Desirability of establishing an example.

1261. Would you suggest or would you think it advisable that experiments should be made in any part of the country either in the way of diverting water or impounding water, for the purpose of showing the public generally the advantages to be derived? I would not call the bringing of a scheme of irrigation into operation an experiment, but I think an example of the sort would be desirable. But before anything is done the minimum quantity of water should be ascertained, and the obtaining of that information cannot be too soon begun, so that it may extend over the approaching summer.

Minimum quantity of water should be ascertained.

Possibility of a water conservation system.

1262. Then, to sum up the whole matter, you consider that it is not impossible or impracticable to carry out a system of water conservation and distribution throughout the Colony? I thought so eighteen years ago, and every year has strengthened my conviction.

Darling waters going to waste.

1263. *Mr. Donkin.*] Have you any practical suggestion to make as to dealing with the waters of the Darling which at present run to waste in the sea? It might be possible to utilize them by erecting movable weirs at the mouth of the tallywalkas. I hold with conserving water in every possible way.

Impounding water below Brewarrina.

1264. Do you think the water could be impounded to any extent in the river below Brewarrina without a scour taking place in its banks? If you had movable weirs you could. You should try and have the water in your reservoirs as deep as possible, in order to present as little surface as possible and thus save loss by evaporation.

Evaporation.

1265. *Mr. Barton.*] Have you ever obtained any evidence as to the amount of evaporation which takes place in the western or north-western district? No, but I have very good evidence as to the evaporation in Sydney. When the Sydney Water Commission was sitting, I wrote to a friend in India and received the information that the allowance for evaporation was 6 feet per annum in the moist climate of Lower Bengal, and that probably the amount was larger in the country above. Adopting that as a basis, I made a calculation with reference to the Botany water supply, and came to the conclusion that after making all the improvements possible they could only count on 3¼ million gallons of water per day. That is about the minimum amount they get now, and my calculation was made fourteen years ago.

Material for weirs.

1266. *Mr. Murray.*] What should the movable weirs be constructed of? Timber or iron.

1267. I noticed that the flood-gates at Maitland had given way through being destroyed by white ants? Those constructive difficulties must be overcome. Iron, of course, is exposed to oxidation.

Diagrams of weirs.

1268. *Mr. Donkin.*] Have you any diagrams of weirs you could lend the Commission? There are some papers in the minutes of the proceedings of the Institute containing diagrams, and I think I have some in other papers.

The Yanko cutting.

1269. *President.*] At the present time there is an agitation to deepen the cutting from the Murrumbidgee to the Yanko: what is your opinion as to the possibility or the advisability of placing a weir across the Murrumbidgee below that cutting, and by that means diverting the water down the Yanko? It is to a great extent a question of cost. Provision should be made for floods, by removal of the weir or otherwise.

1270. But, provided it is not too costly, do you not think that would be a very good way to show on a small scale to the public the advisableness of placing weirs across rivers? Hardly so well as one in the Murray, because you could not by any weir raise the water above the surface of the country immediately at the Murrumbidgee; you might raise it a little above the country below, but I think the Upper Murray would be the best place at which to commence, because you would have complete command of the country there.

1271. But this is a case in which it is proposed to divert a portion of the Murrumbidgee water into the Yanko: I do not know whether it is quite settled that this shall be done, but I believe it is, and that being so, would it not be wise to place a weir in the Murrumbidgee and raise the water in that way—to do it on the Murray would involve great expense? Of the two weirs, the one at the Murray would be the cheaper.

Irrigation by steam pump.

1272. But there would have to be a tunnel? Yes, the collateral expenses would no doubt be greater. There is an interesting paper which I will get for you, written by Mr. Mair, of Groongal, who irrigated by means of a steam pump, and with very successful results. (*Appendix* G 2.)

The diversion into the Yanko.

1273. What I want to get at is this: as there is an agitation at the present time to divert a portion of the water of the Murrumbidgee to the Yanko, is it advisable that that should be done by means of a weir across the river, instead of having an intermittent supply by means of a cutting above? If you are prepared to go to the expense of a lock and so on, it would be advisable, but I do not think you would have a fair example of irrigation, because you cannot command the land. You asked whether it would be advisable as an example.

1274. I did not mean so much an example of irrigation as an example of diverting the main stream of the river? I think it would.

1275. In this instance, where the water is to be diverted down the Yanko intermittently, would it not be wise, as well as furnish a good example, to place a weir across the river and divert a constant supply of water down the Yanko? It might be.

1276. *Mr. Donkin.*] Exactly what has been carried out in Victoria by Mr. Gordon? Yes, but not by movable weirs.

1277. But why should not this be a fixed weir? Because the river is liable to flood. Mr. Gordon has, I believe, made the weirs where there is not much flood-water. They are cheap and inexpensive things in small watercourses.

1278. *Mr. Franklin.*] Would not an ordinary stone weir with movable shutters keep a constant fall at the back if the navigation was not a matter of great consideration? Yes, while the navigation was stopped.

Opening of weirs in India.

1279. Some weirs in India have openings to the full depth, and quite equal to some of our rivers in width? Yes, those openings have been in existence for years, and the difficulty has been how to manage them. The most successful automatic system is to a great extent a modification of the old bear-trap sluice.

Self-acting sluices.

1280. In those places where there is much soakage, would it not be possible to construct stone weirs of the same character as those used in India? I think it would be desirable to keep the tallywalkas and back-water full, and to have self-acting sluices, which would prevent the water from going back into the river when the river fell.

Prevention of great floods.

1281. And if, after examination, a good system could be adopted for the conservation of the upper watershed, would it not be possible by this means to prevent the great floods that take place in the north-western district?

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district? I am afraid the rainfall is so great, in the case of the Hunter particularly, that no possible amount of reservoirage would have the slightest influence on the floods. The reservoirs would be kept full in anticipation of a dry season, and then a flood would come. If you knew when the floods would occur it might be done with advantage.

1282. *Mr. Gipps.*] Would that apply to the Darling as well as to the Hunter? The Darling is longer, but its flood-waters would to a great extent have the same conditions.

1283. *Mr. Franklin.*] It has been conceived that by damming the smaller tributaries of the Darling we could convey water into creeks which perhaps would not be influenced by storms and floods? That is what I have been pointing out—that the effect of the flood would be hardly appreciable; it would to a certain extent, but not to an extent worth considering.

1284. If on an examination of the upper part of the watershed, and by making levels from one watershed to another, we find that water can be conveyed into natural depressions and stored, those outlets would be of very great service? Yes, if stored in a very dry season, it would be very desirable.

Necessity for survey and ascertaining the discharge of the rivers.

1285. *Mr. Barton.*] From your experience you think it necessary for a Commission of this sort, before acting in any way, to make a preliminary survey of the heads of the various rivers? Well, the surveys that exist in the Surveyor-General's Department would give you almost all the information you require. But what I think is particularly required is the measurement of the minimum water discharges. Ascertain that accurately, and also put down on the maps the line of equal rainfall, so that you may know what rainfall to expect from a certain area of country. If you call that a survey, I think such a survey is indispensable and the first thing that should be done.

Division of labour between the members of the Commission.

1286. Can you give us your advice as to the best plan for the Commission to adopt to obtain those surveys? I will give you a case in point. When the Water Supply Commission was first appointed I was not a member, but it was considered desirable that I should be, and accordingly without any solicitation on my part I was appointed. I found that the gentlemen of the Commission had been going about the country all together, and that great differences of opinion prevailed as to what ought to be done. At the very first meeting I attended I suggested that the work should be divided among the members of the Commission, that one should have one thing to do, another another thing, and so on, and that the result of each man's labour should be submitted to the Commission and talked over. That suggestion was adopted, and it is what I would recommend to you. I think a division of labour in such matters is by far the best plan.

Appointment of executive officers.

1287. Do you think the work would be better done by Members of the Commission than by officers appointed for the purpose? In the case of the Commission I have spoken of, two or three of the members had a large staff at their disposal—for instance, Mr. Moriarty, Mr. Adams, and myself. If you have not a staff at your disposal you would certainly want one or two executive officers.

1288. *Mr. Gipps.*] Those officers would carry out the surveys the Commissioners would require, after examination of the country? Yes. The examination of the country would eliminate all but two or three projects that are worthy of particular examination, and you could have them examined by your officers. And, if I might make the suggestion, a progress report showing the result of each examination after it was made should be furnished. It would show the public that something was being done.

1289. *Mr. Donkin.*] I suppose that in making a flying survey barometric heights would be sufficient? Barometric heights will enable you to judge where the surveys should be made.

Mr. John Wright, C.E., called in and examined:—

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1290. *President.*] What is your name and profession? John Wright; I am a civil engineer.

1291. Have you had experience as a civil engineer outside the Colony? Yes, in India and the United Kingdom.

1292. To any great extent? Well, in this particular class of engineering I have had considerable experience. I have travelled a great deal, and having been Instrumental Secretary for the Public Works Commission in India, I had opportunities such as few possess.

1293. Is that long since? About eighteen years ago.

1294. What Commission was it? A Public Works Commission.

1295. Had that Commission much to do with the question of water conservation? It was a Commission on Public Works in general, and it dealt with water-works as part of its duty.

1296. You have read a paper before the Engineering Association of New South Wales on the subject of water conservation, have you not? Yes.

1297. Is this the paper (*Appendix* H)? Yes.

1298. The information contained in that paper has been obtained by you from personal observation in New South Wales, I understand? Yes, decidedly. I am almost a native of the Colony, and have taken a great interest in the question of its water supply ever since I have been able to take an interest in any matter whatever.

1299. You have been in the Colony many years, have you not? Yes, it is forty-four years since I came here first.

1300. Then did you go to India? No, to England.

1301. And from there you went to India? Yes, and from India to Victoria, and from Victoria to South Australia.

1302. Have you been over the western part of New South Wales? Yes, the whole of it; I have gone over the whole western and north-western portions of the Colony, taking the northern line as one boundary, the boundary of Queensland on one side and of South Australia on the other. I have been Consulting Engineer for the South Australian Pastoral Investment Association for the last ten years, and have carried out all their work for water conservation. That of course includes Queensland, South Australia, and portions of New South Wales north of the Darling.

1303. Then you have had every facility for obtaining information as to the possibility of procuring water by well-sinking? Yes.

1304. And also for conserving water by means of tanks? Yes.

1305. Will you give us what information you have with reference to well-sinking, first in the western part of the Colony? Yes, I could, but not from memory. I have been employed in so many cases that it would be impossible for me to name them in detail. I commenced, many years ago, taking notes and obtaining particulars

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particulars as to well. Besides notes I have taken myself I have obtained information from others. I think I have supplied the Hydrogeological Society of England with notes of upwards of 3,000 tanks and wells.

1306. On what stations have you been employed sinking wells? On various properties; the Palartoo, Belama, Black Rock, Cudiginnie, and others.

1307. Are those in New South Wales or South Australia? South Australia. Coming over to the New South Wales border there are a number of blocks, the Cudiginnie blocks, which extend into New South Wales, coming close to Silverton on the soakage. The wells there are only a few feet deep. Wells at Cudiginnie.

1308. Can you give us, by reference to your field-books, or any papers that you have, particulars as to the wells that have been sunk? I could, but it would be an immense labour. If you mentioned any particular part I could supply you with the data.

1309. In the west and north-west parts of the Colony to what depth generally did you sink for water? Depth to water in the west and north-west of the Colony. Commencing on the Darling, at about Mount Murchison, and going north and west from there to Messrs. Crozier and Hughes' property—that is on the Lower Darling—the depth ranges from 60 to 90 feet; after that it gets down to 200 and 300 feet; that is, going towards the South Australian boundary of New South Wales.

1310. Then the further north you go the deeper the wells become? Yes, until you get to the Stony Desert, when it shallows again slowly.

1311. What is the nature of the strata that the water is found in? It is what is termed cretacea-gravel with a few shells in it. The depth we have never ascertained, because as soon as we get to the cretacea there is no necessity to go deeper; the water comes in in such volumes. Nature of strata cretacea-gravel.

1312. Is it artesian? No, I am not aware of any artesian supplies in Australia, excepting one or two. Artesian supplies.

1313. Where are they? One in Gippsland, and the other in Central Australia. I believe there are others, but those are the only ones I have seen.

1314. Is the water in the western country you have described generally good, or is it brackish? In some places it is good and in others it is slightly brackish, but I find that it is gradually improving. As you draw upon it it improves in quality. Quality of water.

1315. Have you had any experience to the north of New South Wales—in Queensland—to any extent? Experience in Queensland. Yes, from the Diamantina, down along the Paroo, Cooper's Creek, and the Narran, and all that way.

1316. And are the strata of the same nature as you have found in the north-west of New South Wales? Yes, in some places it is; you can scarcely see any marked difference—it is simply a difference in the alluvial deposit.

1317. And what bands do you generally sink through? Almost all sorts of Australian geological stratifications, many of them peculiar to Australia, commencing with the ordinary surface mould, and then passing through various kinds of clay, intermixed with marl, occasionally yellow sandstone, and other kinds of rocky schist. In some portions of the Diamantina country you find decomposed granite in small beds. On that account I advised the Hon. George Thorn two or three years ago to sink for wells in that part of the country, and a few months ago he succeeded in discovering water at a depth of about 70 feet. Strata. Depth to water. Mr. Sangar, one of the geological surveyors of South Australia, thought they would not reach water at a less depth than 500 feet, but water has been found all over that part of the country at 70 feet, and they are now going west. Mr. Beverley is going west to the South Australian border, and they are getting water there also. It rises on the central table-land, and when I was there, some seven weeks ago, they were getting water at a depth of 130 and 140 feet. I saw one of the water surveyors from South Australia, and he told me they had struck water further west, within 60 miles of the telegraph line, at 92 feet, so that the depth is getting low again. I have been engaged for numbers of gentlemen in that part of the country; I make surveys for dams, tanks, wells, and what not, but I can hardly give you the number of them.

1318. When the water is struck as you say, after going through various bands and beds, does it rise at all in the shaft? Yes and no. In some places it does, but in others it does not. Rise in the shaft.

1319. Then as a rule it is not artesian water? In a professional sense artesian water is water that rises above the surface and keeps up a good supply. An ordinary well is one in which you strike water and the water may rise but does not overflow.

1320. Where do you suppose the water you find in that part of the country comes from—is it simply surface drainage? Yes, from the actual rainfall. Source of the water.

1321. In the neighbourhood? I would not like to say in the neighbourhood, but when you consider I have travelled 120 miles in from 3 to 18 inches of water you can understand that there must be enormous bodies of water falling upon the surface there, and it cannot all run away. I proved conclusively years ago that it never reaches the sea.

1322. *Mr. Barton.*] Not above ground? No, it is impossible, because there is less water passes at the Murray mouth than passes Wentworth—that I proved by actual observation. Lieut. Gowlland and I made a survey of the Murray mouth, for the purpose of ascertaining the amount of water that flowed down, and we proved conclusively that less passes through the mouth of the river than flowed past Wentworth, and the only conclusion that it is possible to arrive at is that the water escapes underground. Water passing through the mouth of the Murray.

1323. But what I want to arrive at is this: there is a theory that the water found in the cretaceous formation to the north-west is, as a rule, water that comes from higher land in some direction, and I want to ascertain your opinion as to whether that is so or not? I think it comes from the rivers and watercourses. Messrs Crozier and Hughes asked me to go and see their properties on the northern bank of the Darling, with a view to conserving water. Being a Government officer at the time I could not go, but I sent a young man to take levels from the Darling right across to the boundary of their property, and along it as well, and we had the whole plotted out so that we had contour levels. We had then what I may call a block chart 90 miles long by from 30 to 60 miles wide. A well was sunk on the lower portion, and a series of wells were then sunk right through the property, going eastward, parallel with the river. Those wells, although they extended from 8 to 30 miles back from the river, were actually affected by the river, and the reduced level could be determined almost one from the other. A rise in the river caused a rise in the wells, not in proportion to the rise in the river, but still perceptible. The nearer the well was to the river the greater was the rise, and the further the well was from the river the less was the rise, proving conclusively that the underground supply of water was affected by the supply in the river. Source of water in the cretaceous formation. Height of water in the wells affected by stand of the river.

1324. As a matter of fact, that it came from the river? Yes.

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1325. But that is not in the part of the Colony we have been speaking of—the north-western part? It would be in the north-west. It is only about 100 miles from the northern boundary of the Colony.

1326. Did I understand you to say it was on the Lower Darling? Well, you may call it the Lower Darling; it is between Menindie and Wentworth.

1327. But it is to the south of Wilcannia? Yes, slightly.

1328. And it is to the south of a point on the South Australian border, opposite Wilcannia? Yes, it is almost due south of the boundary of Queensland, South Australia, and New South Wales.

Formation the same as in the north.

1329. And is the formation there and the drift in which the water is found the same as it is in the north of the Colony? Sinking to a certain depth it is, to about 60 or 70 feet. The alluvium stratification is about the same. There is very little difference on the large flats, but when you get 70 or 80 miles down the Darling you encounter rock.

Occurrence of rock.

Shells *micobia*.

1330. And do you find the cretaceous formation lower down similar to that higher up? Yes. The shells *micobia* are the same beyond Milparinka as they are beyond Wentworth.

Wells in Deniliquin country.

1331. Have you had similar experience of the river affecting the wells northerly? No; but south of that I have, in the Deniliquin country—that is, including the Murray, the Edwards, the Murrumbidgee, and the Lachlan. I know that country well, and I know that the water in the wells there is affected by the water in the rivers.

Underground currents.

1332. In any well-sinking have you come upon an underground watercourse, or what appeared to be an underground watercourse? I have repeatedly tried if there was any drift, but only in one instance did I discover any. That was in the Gotha Paddock, Cobran, 35 miles from Deniliquin. There I found that on putting corks into a well they went, as it were, from the river Edwards towards the river Murray. In South Australia, in the limestone country, you strike immense streams, but where they lead to you cannot tell.

Streams in limestone country in S. A.

1333. In what part of South Australia is that? Taking the south-eastern area from the Victorian boundary, including Narracourt right down to Coorong and the sea boundary—the whole of the south-eastern portion of South Australia—and further on to Lake Hamilton and Streaky Bay, you can go into caverns as large as this room and there are underground currents alongside you. But a most remarkable feature in the Port Lincoln district is a spring where you can see fresh water bubbling up through the salt water, and can take a drink of fresh water from the sea when you are in a boat. At Kirkalla Station, towards Streaky Bay, they obtain water under very peculiar conditions. Some ten years ago, Mr. Linklater asked me to advise him about getting water. The rainfall there is very uncertain and limited, more so than on the Darling. I suggested to Mr. Linklater that he should sink wells, and he said he had tried and found them unsuitable. He had sunk down to the granite—the primary formation is very close to the surface there, being only some 60 or 70 feet down—but he could not get water. At last a miner suggested that they should drive and increase the area so as to get water by soakage. This was done, and I had a letter from Mr. Linklater some eighteen months ago informing me that he had succeeded in getting perfectly pure water in an almost unlimited supply.

Fresh water in the sea in Port Lincoln district.

Water supply at Kirkalla Station.

1334. *Mr. Barton.*] Is that on the coast? Yes, within 14 miles of the coast.

Source of the water in the limestone formation.

Dismal Swamp.

1335. *President.*] Referring to the water that you found in the formation near the Victorian border, have you any theory as to where that water comes from? Yes, decidedly. The formation there is limestone throughout. The Dismal Swamp has a very large rainfall. It is a large lagoon or lake as you might call it. The rainfall is conserved there, and it is from that source that the underground supplies in the south-east of South Australia are derived.

1336. That is not water that can be in any way traced to the rivers? No; at least, I do not think so. It could scarcely be traceable to the Murray, because the Murray is lower than it.

THURSDAY, 11 *SEPTEMBER*, 1884.

Present:—

MR. BARTON, M.P., | MR. GIPPS, C.E.,
MR. FRANKLIN, C.E., | MR. LYNE, M.P.,
MR. M'MORDIE, B.E.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. John Wright, C.E., called in and further examined:—

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1337. *President.*] Are you ready to continue your evidence? Yes, but I think it would save time if I were to describe a few of the physical features of the rivers of the country, confining myself exclusively to New South Wales, as the Commission is for the purpose only of dealing with the interior of New South Wales.

1338. We should also like some information with reference to the Queensland rivers? Yes, the Queensland rivers also. Of course they would be the tributaries of the Darling. I think that course would save time, and assist you in putting leading questions to me.

Action of Darling waters on the Murray waters.

1339. Very well, give us all the information you can? Well, commencing with the Murray at the boundary of this Colony, and coming upwards, one peculiarity I may notice—though it is not peculiar to this Colony alone—is, that although the river Darling flows into the Murray during flood-time with a large increment of water, yet it actually does not raise the level of the Murray—it simply increases its velocity. In all recipient rivers the same thing occurs. This fact is borne out by the evidence of the leading hydraulic engineers. It must not be supposed that a rise in the Darling will raise the water in the Murray—it never has done so, and never will. Then taking the southern bank of the Murray on the Victorian side, it is high throughout, right up to Albury, whereas on the New South Wales side the bank is invariably low. In some places—as, for instance, between Moama and Echuca, the banks tend to about the same level; but when you get down to Tourangabbie the water appears to drain off towards Thule. The inclination of the surface then is northward. The Loddon is another case in which the waters which flow into the Murray do not increase the height of that river, though a large body of water flows into it. It however increases the velocity. Coming northward again to the Campaspie, which flows into the Murray below Echuca, the same thing occurs. Then we go on to where the Edwards flows out in that big swamp above Moira. In 1861, while

Banks of the Murray.

Effect of the Loddon and Campaspie on the Murray.

The Edwards.

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while on furlough from India, I went from Echuca to Deniliquin by water, in order to determine how the water flowed out of the Murray into the Edwards. I found that it rose in a very large swamp almost the same as Moira, perhaps not to such a great extent, but with nearly the same depth of water. On that occasion I went, at the instance of Messrs. Desailly and G. S. Lang, and other gentlemen, to determine whether it was possible to divert the waters of the Murray into the Billabong. Nature has herself set the example, because the waters of the Edwards flow out of the Murray and into it again. I was not able to complete the surveys, but Lieut. Dawson, R.E., completed them, and proved conclusively that the water of the Murray could be diverted into the Billabong. The cost I was never able to ascertain, but I think it was given fully in the *Pastoral Times* or *Southern Cross*, about 1861 or 1862. That lowness of the New South Wales bank is a notable fact in connection with the watershed area of the Murray. It may not be uniform, but it is generally lower than the bank on the Victorian side; on the Victorian side the rivers of the Dividing Range fall towards the Murray, whereas on the New South Wales side the rivers fall away from the Murray. The natural watercourses therefore appear to flow away from that river. The Edwards flows out of it, although there is a break between the heads of the Billabong and the Murray. The Albury Billabong and the Edwards Billabong, as they are termed, appear to flow towards the Murrumbidgee and Edwards again in a north and north-west direction, or north slightly west. It is now thought a new thing to divert the waters of the Murray into the Billabong, but it is twenty-three years ago since the matter was first taken up by Messrs. Desailly, Lang, and others, who were connected with the matter at the time. The Tappal Creek, although it does not flow exactly out of the Murray, flows from the Murray westward or north-westward. Coming up again to the Billabong we see that it flows in the same way, and there are several watercourses between it and Albury, and between Tocumwall and Corowa. There is a series of dry creeks that appear to lead from the Murray instead of towards it. It is possible, therefore, and has been proved by actual levels, that by making a cutting into the Billabong the water could be distributed over the whole of that part of the country. Accurate surveys have been made of the country between Tocumwall, Moama, Deniliquin, Moulamein, and right down to Balranald, and it has been shown that the whole of the country from the Edwards to the river Murray could very easily be irrigated by gravitation from the Murray, taking the outlet of the Edwards as the source. Out of the Edwards River, a little below Deniliquin, near a station belonging to Sir Patrick Jennings, is the Wakool, which flows down parallel with the Murray and Edwards Rivers, taking up an intermediate position. All the watercourses between lead in the same, that is, a parallel direction, so that if a cutting were made in the river Murray through that large swamp above Moira and into the Edwards River, and the waters of the Murray raised so that they would flow into the Edwards, the whole of that country could be irrigated. Actual surveys were taken to determine whether that could be done, and it has been proved that it can be done. The fall would be about 7 or 8 inches to the mile in some places, and in others from 13 to 15 inches. I had very little to do with the Murray above Albury, the reason being that I did not think it would be judicious to interfere with the head waters of the river, or with any river the bed of which consists of gravel, because you would simply alter the equilibrium of the bed; and rivers the equilibrium of whose bed is altered are very difficult to restrain. You do not know what the result of your interference might be; probably the river might go in an opposite direction, and cause great devastation. It was on that account that I did not go up the Murray any great distance. I saw that gravel beds obtained in it, and besides there were other sources from which water could be obtained. The whole country between the Murray and the Murrumbidgee Rivers could be easily irrigated. Nature herself has shown us that the water flows from the Murray in the direction of the Murrumbidgee. She sets us an example by making the Edwards and Tappal Creek run from the Murray to the north and north-west. Coming to the head waters of the Murrumbidgee at Gundagai the gravel appears again, and it would be difficult to deal with the river in that locality unless you at once constructed a weir across it so as to secure the surrounding country from inundation. Coming down the Murrumbidgee you will notice that the contrary obtains—the waters flow to the southern bank. Take the Yanko Creek for instance. It appears to flow away from the river towards the Murray, showing that there is a fall in that direction. The fall may be slight, perhaps only a few feet, but still there is a fall. I have not been able to determine the exact grade per mile across there, but I have completed a considerable distance below the Yanko, namely, from Oxley across to Fire Braces. There is a fall in that direction, which would be south-west, quite opposite to the fall from the Murray. Now to deal with the Lachlan. That river appears to have formed a valley of its own. The waters flow in both directions, peculiarly in many cases. The Willandra Billabong appears to flow from the west to the east, but when it is flooded it runs apparently the other way. It is as nearly level as possible. I believe the country in that direction could be easily watered from the Lachlan, and there are many places where the water could be taken from the river in both directions. In going from Booligal across to Wilcannia about twenty-two years ago, I took a series of levels, but of course they are of little or no value, because I was unable to continue them owing to the want of water. The country there is practically level from Booligal towards Wilcannia, going across the head of the Willandra Billabong. Now with regard to the Bogan. From the Bogan at Dandaloo it is quite possible to deal with its head waters so as to send water down from Mudall towards Nymagee, between Nymagee and Cobar.

Diversion from Murray to Billabong.

The Tappal Creek.

Surveys

Irrigation by gravitation from the Murray.

Rate of fall.

Effects on the river-bed of interference with the head waters.

Flow of water from Murray towards Murrumbidgee.

Yanko Creek.

Fall from the Murrumbidgee towards the Murray.

The Lachlan.

Watering from the Lachlan.

Level country from Booligal to Wilcannia.

The Bogan.

1340. Have you any levels of that country? Yes; taking Mudall at 194·63, my datum was 200 from where I was.

Levels of the country.

1341. *Mr. M'Mordie.*] That is not with reference to any particular datum? No, it is simply my own. I could not connect with any railway surveys, because the distance is too great. The levels are comparative, just for instance as if you wanted to know the height of this place above George-street. My datum at that time was 200; the height was 194·63 at Mudall, and at Little Nymagee, which is about 7 miles from Nymagee, it was 96·37.

1342. *President.*] How far is it from Mudall to that point? It is calculated to be about 55 miles. Of course I did not chain the ground—I simply took levels in order to determine for my own satisfaction whether it was possible to get down that way. Some time or other it may be my good fortune to connect those levels, as I have done in other places. Sometimes nine or ten years have elapsed before I have been able to do that. The levels I have mentioned would allow plenty of fall for the water.

1343. *Mr. Barton.*] Where would you leave the Bogan? Just about Mudall.

1344. *President.*] Did you take any levels further on? No; I had no time.

1345. Does the country appear to fall in the same ratio? Yes; my levels show intermediate places that are very much higher. For instance, in running up I got up to 228, 224, and 222. I got considerably above that in many places.

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1346. *Mr. Barton.*] Did you level the country in a straight direction, or did you look for the lowest country? There is a station called Panjee, or some such name as that, where there is a track leading to the river, and I followed that on to Nymagee.

1347. *Mr. Franklin.*] What is the highest reduced level you have? It is 229·77. There is a small creek that crosses the track I have spoken of. Its bank is 159·63. The distance can only be a few miles. Only 19 points were taken between the two places.

1348. *Mr. M'Mordie.*] Were you able to apply any checks to your levels? No, but I took them very carefully, and I keep my instrument always in adjustment. I rarely commit an error unless it is in making an entry in the book.

1349. But you had no opportunity of checking? No, not of checking the levels afterwards.

1350. Nor of closing a circuit? No; but in surveying from Moama, Tocumwal, Deniliquin, and Conargo right down the Billabong, and the Edwards to Balranald, and then closing again to an old bench-mark at Euston, in Victoria, I found I was only a foot out in 460 miles of levels. I took these levels with just as great accuracy.

1351. *President.*] Have you been above Mudall? Yes, I have been up the Bogan. I was driven up to an out-station belonging to a Mr. Armit only about four years ago, and from there to Tomingley Creek.

1352. Did you take levels there? No. From there I went across to Dubbo.

Cobar.

1353. Have you taken any levels between the Bogan and Cobar? No, but a friend of mine tells me that Cobar is lower than Nymagee, so that the water of the Bogan could be taken down to Cobar.

The Macquarie.

1354. Have you been on the Macquarie? Yes, and I have been on the Warren, but it was many years ago. I have been to the Marshes and on the Marthaguy Creek, at Sandy Camp.

Its fall.

1355. Have you taken levels there? No, but a friend of mine has. I have the details of the levels and can give you the fall of the river. It falls from Dubbo downwards about 2 feet 6 inches to the mile.

1356. It would appear that the country between the Bogan and the Macquarie is something similar to the country you have described between the Murrumbidgee and the Murray, so far as fall is concerned? Very much the same.

Country between Macquarie and Bogan.

1357. At or near Warren there appears to be a creek flowing from the Macquarie and joining the Bogan? Yes; I do not know the country from my own observation, but a gentleman connected with the Railway Department took a few levels across there at my request about three and a half years ago, and he tells me that the waters can all be led from the Macquarie towards the Bogan.

1358. *Mr. Barton.*] Did you ever see the Macquarie Marshes? Yes. I went down the Marthaguy Creek from Sandy Camp and then crossed over to the Marshes.

1359. *President.*] Have you any record of the height of the Macquarie just above the Marshes? No, I have not.

Levels.

1360. Nor of the Bogan? No; I took some levels at the Mara Creeks, but they have no bearing relative to one another. Levels were simply taken for the purpose of local supply. The fall varies from a few inches to 2 or 3 feet, so that without a uniform section it would be hard to determine what was its hydraulic slope on both those creeks. I have travelled over that country, and I feel quite sure that it could be watered from the Castlereagh, towards the Bogan.

1361. But you have no levels? No, I have none of that country. I have been from Coonamble right down to Walgett, but I took no levels. I have taken levels on the Namoi.

Levels on the Namoi.

1362. What levels have you taken there? From Walgett to Pilliga, and from Walgett to Wee Waa. The fall of the Namoi from Wee Waa to Walgett is about 11 inches per mile, that is, taking the distance as shown upon the maps. Of course I did not chain it. The distance is given on the maps as about 64½ miles.

1363. Have you any other levels higher up? No, I have no levels higher up, but they can easily be ascertained right up to Narrabri from Breeza, from the railway levels, which would give the actual fall. You could get the reduced level from Tamworth. That would give a good idea as to the level, because the water falls from Tamworth downwards.

1364. What is the comparative level at Wee Waa as compared with that of the Bogan? I cannot tell you that. It would take an immense amount of time and trouble to connect the surveys. What I have done has been simply for my own information.

Country on the Moomin, Dumaresq, and Gwydir

1365. Have you been on the other tributaries of the Darling further up? Yes, I have been on the Moomin, Dumaresq, and Gwydir. I have been all over that country for my own information, to Gunnedah right up to Marilla along Pooncarrie down the Big River, and along by the Moomin and Gwydir Rivers.

1366. What do you say then as to the levels of the country? The country is intersected by hills and undulations, and it appears to me that the whole of it could be watered if you could conserve the water in the watercourses. Taking the whole of the country from the Bogan right through it could be easily watered. The only difficulty occurs on the north-western side of the Darling. The water could be easily conserved between the Bogan and the Macintyre Rivers. There are so many watercourses and so much water flowing down there that a few thousand pounds expended on it would, I feel sure, secure ample supplies.

Conservation of water between the Bogan and the Macintyre.

The Darling.

1367. You have been along the Darling? Yes, the whole valley of the Darling.

1368. Have you any levels about the junction of the Macintyre with the Darling? No, I have not.

1369. You have been on the rivers leading from Queensland to the Darling? Yes, the Bokhara, the Narran, the Warrego, the Paroo, and the Culgoa.

1370. Have you any levels of those rivers? Yes, of a number of them.

Fall of tributaries to the Darling.

1371. Can you give us anything like the approximate fall? I could give you the levels in detail, but I have not brought them with me. The falls run from 8 to 14 inches in the mile. That would probably have to be reduced to from 6 to 10 inches; perhaps even less than 6 inches in many cases, because great lengths of the Culgoa, and of the Bokhara especially, are, comparatively speaking, level—the water flows both ways. In the lower trunk of the Bogan the water will flow from the Darling a long distance when its upper tributaries are flooded.

1372. *Mr. Barton.*] Down the Bogan? Yes, the water will be backed up. I have seen the Warrego backed up by floods in the Darling for 20 miles.

Out-run of the Paroo.

1373. *President.*] The fall in most of those northern rivers is about the same? About the same. The Paroo of course does not flow into the Darling, but runs into a sort of swamp or soakage, the same as obtains at Umberumberka Creek, near Silverton.

1374. You say the Warrego River loses itself? No, the Paroo.

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1375. In sandy country? Yes; it is not altogether sand, nor is it clay; it is a a porous stratification.
1376. Do you think the water rises again, or is it lost altogether? If it goes anywhere it goes to the Darling underground; it goes away somewhere underground.
1377. It loses itself? Yes; the Narran does the same.
1378. *Mr. Barton.*] The Macquarie does pretty much the same? Yes, it runs into the Marshes. There is an interesting fact which came under my notice on the Namoi, at a place owned by Mr. T. P. Wills-Allen, near Gunnedah. That gentleman has a wool-washing station, where he washes a large number of sheep, and in doing so he uses 40,000 gallons of water per hour. With the idea of utilizing the water afterwards he thought he would irrigate a portion of his land, and he pumped for about a fortnight at the rate of 40,000 gallons an hour, but the water never extended beyond a certain point. On examination he discovered an immense crack in the alluvium, through which the water disappeared. He proposed taking me up there at the first opportunity to have the crack opened up in order to see what could be done to prevent the waste of water, and I expect to go up there in a short time to see him about the matter.

The Narran Creek in the alluvium on the Namoi.

1379. You say that the creeks which you have named, out to the west of the Darling, lose themselves in the same way that the Paroo does? Yes, they go into the earth, but they are found again about Silverton in what is called the soakage. The water simply sinks for a few feet, and then the magnesia in the clay formation renders it unfit for use. If you sink below the soakage you do not get the water.

The creeks about Silverton.

1380. Then you presume that the water found at Silverton is the soakage from the creeks that escapes underground? Yes, I am sure of it; there is no other means of its getting away.
1381. *Mr. Franklin.*] You say that on taking the levels from Mudall you found that for a distance of 4 or 5 miles there was a great depression? No, there was a rise of 41 feet, but that could be overcome easily enough. With regard to the water supply of the Darling, the Bogan, the Macquarie, the Castlereagh, the Namoi, the Moonbi, the Gwydir, and the Macintyre supply the Barwon, and the Barwon supplies the Darling and the rivers on either side. The rainfall from the Dividing Range on that side and the rainfall going southward from Queensland fill the Warrego, the Culgoa, the Bokhara, the Narran, and the Paroo. The whole of the country thereabouts is subject to inundations independently of the rivers altogether. In coming across from the Paroo some twelve years ago there was a heavy flood, and the whole of that part of the country was inundated.

Water supply of the Darling.

Inundations independent of the rivers.

1382. Has the amount of water discharged from the Macquarie River into the Macquarie Swamp been ascertained? No, it has not been ascertained.

Discharge of the Macquarie.

1383. I suppose it is assumed that the quantity is very large? Yes. Of course we can only arrive at an approximate quantity, because gauging requires years, and I do not think that there is any accuracy necessary in the gauging. We have the flood-levels, and we know that a certain fall will cause a certain velocity and a certain height. That has been determined by hundreds of observers, and if we know that, we can calculate the quantity of water that passes into the Marshes.
1384. *Mr. Barton.*] Unless it gets away underground? Yes.
1385. *Mr. Franklin.*] But is it not apparent that the ground is retentive in the Macquarie River up to the point of discharge into the Macquarie Swamp? Yes, it is retentive, but it is also retentive on the other side of the Darling. The Narran also is retentive; it is a large clay-pan apparently.

Nature of soil on the Macquarie and Narran.

1386. Then knowing that this portion of the Macquarie is impermeable if it were dammed at that point, and your levels showing that the fall is to the westward, would it not be possible to divert the water into the Bogan? Yes, quite easily.

Diversion from Macquarie to the Bogan.

1387. What would be the distance? I dare say it would be about 20 miles.
1388. *Mr. Barton.*] From the head to the Swamp? Yes; or you could go up to Mount Foster, and then divert the water to the heads of the tributaries of the Macquarie.
1389. That would increase the distance to about 30 miles, would it not? Yes.
1390. *Mr. Franklin.*] You have no levels between those two rivers to show if the fall is the same? No.
1391. Suppose we increase the flow of the water in the Bogan from the point mentioned, then by diverting the water from the Bogan for irrigation purposes we could compensate for the additional discharge? Yes, and I dare say it would probably do more than that. If it is ascertained that there is large waste of water we might go into the dry country.

Irrigation from the Bogan.

1392. And prevent any further flooding in the main river? Yes, you could utilize the water that now goes to waste without interfering with the rights of any frontages.
1393. *President.*] Do you think there is no spot between Dubbo and the Marshes where the water is likely to get away—no gravel beds? No doubt the Macquarie contains more gravel beds than any of the other rivers. If you dam or weir any river you must expect to lose a large quantity by soakage or percolation, and the more permeable the strata the greater is the quantity of water you lose. My object in taking levels has been a purely private one. I have had an idea that the construction of weirs on all the tributaries would mitigate if not altogether prevent the effects of protracted droughts, and I have arrived at the conclusion that it can be done.

Gravel beds in the Macquarie.

Weirs to mitigate effects of droughts.

1394. *Mr. Franklin.*] Are the tributaries of the Bogan very dry in ordinary weather? Yes. There are a few waterholes; in fact the whole of these rivers, when I saw them four months ago, were nothing but a chain of waterholes. The highest rise in the Namoi this year has been about 5 feet. That was at Gunnedah. It has been less lower down the river—about 2 feet 6 inches at Walgett.

Height of water in the Namoi.

1395. *President.*] And you consider the creek that goes out of the Macquarie near Warren is such a creek as the Yanko? Oh no. The Yanko in its cross-section is as large in some places as the Murrumbidgee. The Billabong in many of its cross-sections is larger than the Edwards.

Cross-section of the Yanko and Billabong.

1396. But I am speaking of the spot where it leaves the Murrumbidgee; are not the natural features very much like those of Duck Creek, where it comes out of the Macquarie at Warren and joins the Bogan? So far as surface appearance is concerned there is very little difference between the two.

Duck Creek.

1397. Each of them comes out of one river and runs across a belt of alluvial country into another? Yes; the Yanko of course joins the Billabong.
1398. But is not the country about the Macquarie and the Bogan very similar to the country between the Murrumbidgee and the Murray, down to the Yanko? Do you mean with regard to its profile?
1399. Yes, the surface? Yes, very much; it is a little more hollow. There are hills scattered about there which do not obtain in the other locality at all, but with that exception the general profile of the country is the same in both places.

Similarity of the country Macquarie-Bogan and Murray-Murrumbidgee.

1400. *Mr M'Mordie.*] I think you told us that the flood coming down the Darling and joining the river Murray does not raise the level of the Murray, but increases its velocity? Yes.

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1401. While the cross-section of the river, the hydraulic mean depth and the fall remain the same, the velocity and discharge are increased? Yes.

1402. I think you said you would not take a canal out of a river where the bed was of gravel? Not where I knew that the gravel was movable, or unless I had assured myself that it would not be likely to alter the equilibrium of the bed.

Features of river-beds.

1403. What better bed would you like than a gravel bed? Rivers present three features of bed. The first is large stone and gravel intermixed; the next is sand, and the third is silt. The silt portion of the bed in all rivers has a slight fall; in sandy beds the fall is slightly increased, but with gravel beds the fall is the greatest that is known.

Objections to weirs in gravel beds.

1404. There is also the boulder bed and the rock bed; but I want to know what are your objections to cutting a river bank to take out the water when the bed is of gravel? I have no objection if you simply cut the bank, and by that means divert the water without obstructing the water-way.

1405. Would not a rock bed be better than gravel? Certainly.

1406. And gravel better than silt? No, because the gravel having a greater fall, the water moves faster. Take the case of the works in the Irrawaddy in India. The whole of the weirs were filled up in a very short time. Again, in the Arno, they filled up 72 feet in the gravel beds.

1407. So you would prefer to take the canal out of a sandy bed in preference to a gravel bed? Yes, unless the obstruction was not too great.

Offices held in India.

1408. You spoke of being on furlough from India in 1861: in what Branch of the Government Service were you employed? I was employed by Colonel Haigh, the Director-General of Public Works, at Peshawar.

1409. What was the official designation of your appointment? I was an engineer of the second grade at the time.

1410. Which of the grades—that of superintending engineer? I was superintending engineer of the roads at Peshawar; Colonel Haigh was the engineer in charge of the district.

1411. That is the next class to Chief Engineer? Yes.

1412. And you had charge of a circle? Yes, I had charge of a circle in the Roads.

1413. Do you know the head of the Bari Doab Canal? Yes.

Canals in India.

1414. Do you remember the nature of the bed? No, but I have all the particulars respecting it here. I have the condensed particulars, both financial and constructive, of the whole of the canals in India. I thought they might be of interest to some of the members of the Commission. The work is Darcy Jackson's; he was in charge of the Bari Doab canal at one time, I think.

Character of banks and beds of Billabong.

1415. *Mr. Gipps.*] What is the character of the banks and beds of the big Billabong Creek? The bed is in many places exactly the same as the surface of the surrounding country—red sandy loam, held together by streaks or bands of clay.

1416. It is perfectly impervious then? Yes; none of the dams that have been constructed on the Billabong appear to leak.

Discharge of Murray.

1417. Do you know the lowest discharge of the Murray at Albury? No, I do not. I do know, but I have not the data here.

1418. Do you know the discharge of the river at all at Albury or at Wentworth? I have not it with me.

1419. What evidence have you that the quantity of water in the Murray does not increase beyond the Darling River? The cross-section and the velocity were taken by the Engineer of the Water-works Department while I was Assistant Engineer in South Australia, and the quantity of water that flowed out of the mouth was afterwards calculated by Lieutenant Goalen, an Admiralty surveyor.

Increased velocity.

1420. Then how do you explain the increased velocity beyond the junction if the volume is not increased? That is explained by the fact that water rolls; it does not slide, and the pressure becomes greater. A greater weight of water is forced down at a greater rate, and forces what is before it at a greater rate.

1421. But that would not explain the increase of velocity, because there is apparently no increase of water with it? There is no apparent increase of volume, but there is an increase of velocity. Of course the faster water runs over a weir the greater the quantity that will flow over. If the velocity of approach to a weir is 2 miles an hour, and 1,000 gallons of water flow over the weir, if the velocity is increased to 8 miles an hour the quantity of water which passes over the weir will be greatly increased.

Sections of the Darling and the Murray.

1422. *Mr. Franklin.*] Do you know if there is in existence a section of the river Darling at its junction with the Murray at Wentworth? Yes, there are many.

1423. And also a section of the Murray at the same point? Yes, both above and below the Darling. There are numbers of them; I took no less than twenty or thirty myself.

Observations on the varying heights of the Murray.

1424. Do you know whether there are any observations in existence of the varying heights of the Murray below the junction, both at flood-time and otherwise, to strengthen your statement as to there being no rise in that part of the river? At a meeting of the Engineering Association I stated that the supposed increase of water from the tributaries did not raise the water in the recipient stream. Mr. Breadmore states, at page 235, vol. 27, Minutes and Proceedings, Institute of Civil Engineers:—

> From which it appeared that while feeders were discharging into the main river an additional volume of from 10,000 to 30,000 cubic feet per second, the main river appeared to be discharging the same total as before the junction of the tributaries.

1425. *President.*] I understand you to say that although a large body of water goes into the Murray from the Darling at Wentworth, the water in the Murray does not rise higher on its banks? No, but it is increased in velocity.

1426. *Mr. M'Mordie.*] And therefore in quantity? Yes, but there is no perceptible rise; there is an increase of velocity, but not of volume.

1427. *Mr. Gipps.*] Have you been at Wilcannia at all? Yes.

1428. Have you taken any cross-sections of the river there? Yes, two or three, above and below Wilcannia.

The river at Wilcannia and at Bourke.

1429. Is the river wider at Wilcannia than at Bourke? No, I do not think it is; if you take a long straight reach and a series of cross-sections and balance them, it will be found pretty much the same in both cases.

1430. What is the lowest level of the river at Wilcannia? That I could not tell.

1431. Does it ever run dry? That I could not tell; I have heard that it has been dry.

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1432. *Mr. Franklin.*] You know the tallywalka? Which of them?—There are several.
1433. The one that runs parallel with the river about Wilcannia? Yes.
1434. Do you think it possible to put weirs on the tallywalka and to retain a large portion of the water? Yes, you could retain thousands of millions of gallons by the construction of weirs at those spots.
1435. Do you know the slope of the country from the tallywalka to the eastward? The slope is very slight; I think it is only an inch or 2 inches in the mile at most, so that sometimes it backs up and at other times it runs down; but there is such a number of these tallywalkas and millpools throughout the Darling country that weirs thrown across would not at all affect the water going down the Darling, while an enormous quantity of water could be conserved, because the beds of the dry creeks or anabranches of the Darling are apparently impervious.

Slope of country from tallywalka.

Conservation in tallywalkas.

1436. Do you think it possible to impound the water and divert it by shallow cuttings into natural depressions between the Lachlan and the Darling? Quite possible—I have determined that.
1437. And if on local examination we find such depressions, instrumental examination would lead to such work being done? Yes, it would. I will read the result of an actual survey.

Conservation in natural depressions.

The construction of two weirs on a watercourse upon the west bank of the Darling River, at a cost of £2,990 each, would impound 7,000 million gallons of water (sufficient to supply the city of Sydney for five years) cover at flood-level an area of about 14,000 acres, extend back from the river 18 miles, and give a water frontage of 61 miles; the weirs being respectively 17 and 20 feet in height, 104 and 93 feet in length, and 8½ miles apart.

That is from an article I wrote for a newspaper. I am now engaged in taking as nearly as I can the longitudinal sections of the river, with a view to seeing how much water could be conserved in the tributaries of the Darling. I do not see how the construction of weirs would affect, as some people say it would, the landholders lower down the river, because the first flood would fill the whole stream, and not only that, but the water would distribute itself—it would go away itself. If we had annual instead of periodical floods the loss sustained would not be half so great as it is: and the only way in which you can utilize small floods is by constructing weirs, thereby raising the water and distributing it artificially in the way that Nature does.

Utilization of small floods by weirs.

1438. Can you tell us in what direction you might naturally convey the water from the Darling? It would go in all directions. You require to see the country for yourselves in order to understand. You will find that the water will back up in the river and come out at a point (say) 10 miles below Wilcannia, and perhaps go 30 miles to the south and west.

Direction of distribution from the Darling.

1439. Would not that convey the idea that the bed of the Darling is in some cases not very much higher than the country laterally; that is when you take a series of levels at right angles to the course of the river? No, only slightly so; it rises towards the Lachlan. I am of opinion, and I hope to live to prove it, that there is a possibility of taking the water from above Wilcannia or higher up to Oxley.

Rise toward the Lachlan.

1440. Do not you think it would be worth while to make an examination in order to ascertain whether if the water were impounded in the tallywalka we could find a natural fall towards Oxley? That is what I would like to do, but I cannot afford it. I hope to be able to do it. I shall connect some levels in a week or two that will resolve a portion of the doubt.

Diversion from Darling to Oxley.

1441. Are you aware of any dry lakes in that neighbourhood at all? No; there is apparently about Conoble what appears to be a large indentation, but whether it would be a lake or not I cannot say. I went across from Ivanhoe to Coonamble, and there you leave the sand-hills between the Darling and the Old North Road, as it is called. To all appearance it is very level country.

Indentation about Conoble.

1442. *Mr. Gipps.*] Does the bed of the river Murray ever rise above the surrounding country? Nowhere that I am aware of.

Height of bed of the Murray.

1443. Nor of the Murrumbidgee? Nor of the Murrumbidgee.

Of Murrumbidgee.

1444. Nor of the Lachlan? Well, perhaps the Lachlan would, down about Balranald, though I scarcely think it would.

Of Lachlan.

1445. It does between Forbes and Condobolin? I have not been there much to take notice.
1446. *President.*] You have made some experiments in regard to evaporation, have you not? Yes.

Evaporation.

1447. Will you give us any information you have? The information I have I supplied in full detail to the Government Astronomer, Mr. Russell; but the object of my observations was to determine the maximum evaporation.
1448. *Mr. Barton.*] In certain districts? As near Central Australia as possible—the driest portions. My assistant has been three years and myself twelve months taking observations accurately every day, and we find that it varies from 90 to 98 inches per annum; that is the maximum evaporation.

Maximum evaporation.

1449. *President.*] That is on the water surface? Yes; Mr. Russell has all the details; I have no doubt he would willingly supply the Commission with them, and save me the trouble of again writing them out. The observations were obtained in this way:—On a sand ridge at about 80 miles from Barringun, near the border of Queensland, I had an iron tank 10 ft. 6 in. by 10 ft. 6 in. by 1 foot. Inside of that I put a lining of 3-inch Oregon pine, with 3 inches of earth under the lining on the bottom. Every day the tank was filled with water and the evaporation recorded.
1450. *Mr. Barton.*] Was the tank in an exposed situation? Yes, on a sand ridge on an open plain.
1451. *President.*] Those observations, you said, have extended over three years? Yes, this is the fourth year.
1452. *Mr. Gipps.*] What was the actual depth of the water? Six inches—that was the maximum depth. It went down to 2 inches sometimes before we filled it again. In conserving water for pastoralists it is necessary to know the maximum evaporation—not the minimum or mean evaporation.
1453. *President.*] Would the evaporation be the same if the water was deeper? No, it would be very much less.
1454. Have you made experiments to ascertain how much less? I have had several opportunities of doing so. At Nelshaby, on the Flinders Range, while assistant engineer in South Australia at the Napperby dam, the greatest evaporation was half an inch in one day. That was in 1876 or 1877, but the mean annual evaporation was about 4 feet 5 inches.

Greatest evaporation in one day.

1455. What depth was the dam? From 12 to 14 feet.
1456. And the evaporation was about 4 ft. 5 inches in twelve months? Yes. In a tank at Buerta near the Queensland border the evaporation amounted to 7 feet, but no doubt a certain proportion of the water was lost by percolation and soakage. The Astronomer of South Australia, Mr. Charles Todd, gives the mean annual evaporation in that Colony at 6 feet. In India the evaporation is given at a quarter of an inch per day.

Evaporation in South Australia: in India.

1457. *Mr. M'Mordie.*] In what part of India? The Red Hills, I think, near Madras. 1458.

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1458. *Mr. Gipps.*] At Bombay, at the reservoirs there, the evaporation is given at 80 inches for the whole year? I think the instructions given to the hydraulic engineers in charge are to have their calculations on a quarter of an inch per day.

Mean evaporation.

1459. *President.*] From the experiments you have made, what do you consider to be the mean evaporation? About 5 feet.

1460. What would be the evaporation in a tank 20 feet deep? 5 feet, but that is mere assumption. I have no definite data to guide me, except indirectly.

1461. But you state that the actual evaporation from a tank 12 feet deep was 4 feet 5 inches? Yes.

1462. Well, if the tank were 20 feet deep the evaporation would not be so great in proportion? Well, the difference between the two would not be so great. The heat of the sun is supposed to extend to about 12 feet, but I do not think it can affect the water to a depth of 20 feet. I found that in the driest part of the country the evaporation from an open exposed tank was about 5 feet.

Tanks.

1463. Have you had any experience with reference to tanks generally? I have constructed tanks to hold altogether some four or five million gallons of water.

Best depth for tanks.

1464. What depth do you consider a serviceable tank would be? The greater the depth the less the evaporation; and the smaller the area you expose to the sun, the less the evaporation also. For pastoral purposes—that is for watering sheep and cattle—I think from 20 to 30 feet is the best depth if you can get it. Of course, you are limited in many places by the stratification, and again by the extra cost of cutting to that depth. For the purpose of water conservation the best depth is from 20 to 30 feet; for economy, the best depth is about 12 feet.

1465. *Mr. Barton.*] From 12 to 20 feet? Yes; the cost rapidly increases when you go further than 12 feet.

1466. *President.*] What depth of water do you consider would contain permanent water without fail—what depth of tank would be required to contain sufficient water for one or two years' drought? That would depend entirely on the consumption. About 20 feet would be an ample depth, assuming that none was used. We have tanks that were excavated some five years ago in country that has not yet been stocked, and there was plenty of water in them four months ago.

1467. *Mr. Franklin.*] But in two years the water would be reduced by 10 feet? I do not know what the evaporation was. Four or five tanks were sunk and they happened to get filled by one of the tropical showers, and there was plenty of water in them in February last.

1468. *Mr. Barton.*] Where are those tanks? West of Mount Urangaret, between there and Strangway Springs, west of the overland telegraph line.

Batter of tanks.

1469. *President.*] What batter should a tank have? I give them as little as possible. I prefer 1 to 1, and to secure the tanks so that sheep and cattle cannot get into them; but 1½ to 1 is ample.

1470. Do not you think that with 1½ to 1 there is a danger of the sides falling in as the water recedes? No, I have never found it to be so. If disturbed by the sheep, the banks will no doubt undermine and fall in.

Natural indentations.

1471. If water was conveyed from the various rivers through dry country in the manner you have described, and tanks were made in the vicinity of the stream of water, do you not consider that it would be a good plan to fill the tanks from the stream as it was necessary? Yes; but I do not think that it would be necessary, because there are sufficient natural indentations which could be availed of if you could only get the water to them.

1472. Without making tanks? Without making tanks.

Damming of dry creeks.

1473. But would not the same quantity of water last longer in a tank than in an open swamp? No doubt; but there is a number of dry creeks intersecting the whole of Australia, from 10 to 20 feet deep, in which there is no water except during flood-time. They could be dammed and filled with the flood-waters.

1474. What I mean is that, supposing a scheme to be adopted for diverting the water from the various channels through the country by means of weirs and dams, would it not be wise so to make the dams that water could be run into them from the streams after two or three dry seasons? It would make assurance doubly sure—it would ensure a supply of water whether you had floods or not.

Depressions in tributaries of rivers serving as tanks.

1475. *Mr. Franklin.*] Do you not think that in the tributaries of the rivers we have been discussing it would be possible to find such depressions as you speak of, and to further deepen them by an inexpensive mode of excavation, so that by damming one end we could provide such tanks as you have been asked about? Yes; that was what I was about to explain.

1476. Then by the establishment of small weirs we could divert the first rush of mountain torrent and fill these depressions, although formerly they were not connected with any tributaries? Yes.

Tank at Buerta.

1477. *Mr Gipps.*] Or perhaps by forming embankments around them? Yes, there are numbers of ways in which it could be done. For instance, we have one at Buerta. You may see a section of the dam attached to the Report of the Select Committee on the Pastoral Dams Bill. By means of a dam 11 feet high we throw the water back 56 miles. It inundates the country the same as if the heaviest flood ever known had occurred. That is between Strzelecki's and Cooper's Creeks, in one of the dry watercourses there.

Depressions at heads of rivers.

1478. *Mr. Franklin.*] Do you think there are any very large natural depressions at the heads of the rivers, where, by making weirs, we could store an enormous quantity of water and regulate its discharge? Yes, I could point out a number of places.

1479. You are aware that portions of the country are often flooded by rain-storms, and that the water never finds its way into the rivers at all? Yes; it cannot disappear by evaporation—it must disappear by soakage. I have travelled 120 miles in from 6 to 18 inches of water.

Storage of water from rain-storms.

Improvement of navigation on the Darling.

1480. Do you think that if we diverted those great rain-storms into natural reservoirs, we could prevent that constant rush of water that inundates the flat country? Yes, and let it out at will. You could control it as it is done in some of the rivers in France. It would really improve the navigation of the Darling if you dammed the whole of its tributaries, because the navigation might then be made constant, instead of intermittent.

Conservation in the Namoi.

1481. Which would be the best part of the river heads to deal with, or the most favourable part of the country for such work? If you want a general idea of it, I think the Namoi would be as good a river as any other. It is not the largest river and it is not the smallest, but it is about the mean, and its discharge is also about the mean. You might take either the Macquarie or the Gwydir or the Namoi or the Bogan. As a mean I think the Namoi would be about the best. See what an amount of water could be conserved

on the Namoi by means of weirs, the uses to which it could be put, the amount that could be diverted, and the distance to which it could be diverted. Mr. J. Wright, C.E.

1482. *President.*] Are there any large natural basins about the head of the Namoi? Yes, at Gorah there is a lake which would give a frontage of 50 or 60 miles of water. Then there is what is called the Gunnible Swamp, which would hold 5 or 6 feet of water. It has not been filled for a number of years. Down at Wee Waa there are several lakes or indentations, as they may be called, which could be filled with water, their lower portions being dammed up. I could mention hundreds of places where there are indentations of that kind. 11 Sept., 1884. Natural basins at head of Namoi.

1483. *Mr. Franklin.*] Do you think that if we sought for information from the pastoral tenants they would inform us of such places, or would they, for purposes of their own, withhold the knowledge? I have always found them very willing to supply me with any information they possessed, although certainly they have not felt inclined to accept professional advice to the extent which perhaps a professional man would like. It should be borne in mind, however, that the information they would give, though not intended to mislead, might do so. Information from pastoral tenants.

1484. Did you find in many cases a feeling on the part of the pastoral tenants that the filling up of the indentations would be a loss to them? No, I think they know the value of the edges of the water—they would be only too glad to see the water there; although it would curtail their grass, the gain would be greater than the loss.

1485. *President.*] But if you made a reservoir with 60 miles of frontage, that would take up a whole station? No, it would not when you go all round. When I mentioned the Gorah Lake, that was an exceptional case. Gorah Lake.

1486. *Mr. Franklin.*] Do you think that, in the interests of water supply on some stations, the holders of the property would be induced to bear the expense of testing the levels between their places and the river? No; their insecurity of tenure causes them to keep their pockets closed as tightly as possible. If you gave them a fixed tenure so that they would be assured in possession of the land for a number of years they would do so, but at present, when the making of improvements simply brings blackmailers upon them, they do not care to spend a single shilling more than they can help. If they had a secure tenure I do not think there would be any necessity for the Government to take in hand any scheme of water conservation, for pastoral lands at any rate. Testing the levels at the expense of property holders.

1487. *Mr. Gipps.*] With regard to your objection to weirs on gravel beds, I suppose it would not apply if the banks of the river could be made intact? No.

1488. Therefore a movable weir which would do that would be unobjectionable? Yes. Movable weir.

1489. *President.*] You said, I think, that you did not go above Albury to see whether anything could be done to divert the water of the Murray, on account of the gravel in the river-bed? Yes, I only went a short distance above Albury. The deposit is black soil, very friable. Nature of the Murray banks above Albury.

1490. But the banks of the Murray higher up are not composed of black soil as a rule? Well, it seemed to me to be good agricultural land on the sides of the river—nice black soil, and friable.

1491. As you go up the Murray to the point where the water can be diverted to the Billabong, wherever there is any silt or any obstruction in the river, there you find large water-worn boulders? And gravel lying between them.

1492. Yes, but not much gravel, and there are no flats in the river at all—in many places the river runs through a gorge: where that is the case the river-bed would not be interfered with by diverting the water? No, not if the banks are good and sound and the river runs through a gorge or among rocks—that is the best situation for diverting water.

1493. And if a weir were placed there, the fact of taking away a portion of the river water would not be likely to affect the channel below? No, it would not affect it in the least. Effects of weirs on river-beds.

1494. I thought you meant that the channel would be affected below the weir? No, it is above the weir where the bed of the river would be affected. The water would carry the gravel down and materially increase the slope. It might break away and place itself beyond your control then.

1495. But supposing that the country of the Upper Murray is not as you suggested, no harm would arise from diverting a portion of the water into the Billabong? Not a portion of the water, but the proposition has been to divert the whole of the waters—to let them flow out and in again. But when you divert a portion of the water, it simply means the raising of it by a series of small weirs to the height you want it, and then diverting it, without affecting the equilibrium of the bed at all. Diversions from the Upper Murray.

THURSDAY, 2 OCTOBER, 1884.

Present:—

Mr. BARTON, M.P.,	Mr. LYNE, M.P.,
Mr. FRANKLIN, C.E.,	Mr. MURRAY, M.P.,
Mr. GIPPS, C.E.,	Mr. M'MORDIE, B.E.,

W. J. LYNE, Esq., M.P., PRESIDENT, IN THE CHAIR.

Arthur Pepys Wood, Esq., called in and examined:—

1496. *President.*] What position do you hold, Mr. Wood? That of Assistant Engineer in the Roads and Bridges Department. A. P. Wood, Esq. 2 Oct., 1884.

1497. What experience have you had in reference to the tanks and wells on the stock routes of the Colony? I have been connected with those works for about fifteen years.

1498. Have you recommended most of the tanks and wells which have been put upon the stock routes in the western part of the country? Yes.

1499. And you know that part of the country well? I am pretty well acquainted with it.

1500. Have you read before the Royal Society any papers in reference to it? A paper of mine was read before that Society. Paper read before Royal Society.

1501. I suppose you have none of those papers with you now? Yes, I have a copy, which I produce. (*Appendix I.*)

1502. In this paper you deal principally with water supply for stock routes and water supply for irrigation? Yes.

1503.

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1503. In the western country what machinery do you generally use for putting down wells—boring wells for water? Of late years that work has been carried out by a different Department, but when I went to that district first we put down a good many bores and then used the old-fashioned rods.

1504. Then your particular duty has been in *sinking* for water and not *boring* for water? Yes, of late years.

Size of tanks. 1505. What is the particular size of tanks you generally provide? From 18,000 to 20,000 cubic yards, and not less than 18 feet deep.

Disposal of spoil. 1506. Do you always make silt tanks? Invariably. We also dispose the excavated material in an embankment surrounding the main excavation, within which, when the features of the country admit of it, the water is stored above the natural surface.

Storage above natural surface. 1507. In what way do you store it above the natural surface? When possible, by gravitation.

1508. In every case? No, there are many places where the features of the locality will not admit of it; in such cases we purpose erecting pumping machinery.

Depth of wells. 1509. What is the depth of the wells on the other side of the Darling River? They vary very considerably, ranging from 50 to over 500 feet.

Quality of water. 1510. Is the water good? It varies in different localities. I think that as a rule it is better on the north side than on the south side of the river.

Nature of drift and soil. 1511. Is the nature of the drift and soil you passed through there the same on the north as that on the south side of the river? No, it is different. On the north side our wells have been sunk through alluvial deposits, through clay and sand-beds, while on the south we have had to deal with rock in many cases.

1512. When you refer to the north side you mean the north-west? Yes, the north-west side of the river.

1513. Is the difference particularly marked at the Darling by the division of the country by that river? I cannot answer that question, as we have not put down any bores or shafts between the Darling and the Manahra range.

Distance from the Darling. 1514. How far is that from the Darling? About 70 miles from Wilcannia, and it is here that when travelling northwards a great change is to be noticed in the character of the country.

Character of country between Manahra range and Darling. 1515. Between the Manahra range and the Darling the country would be similar to that on the south-east of the Darling? No, I believe the character of the country alters here; that to the south of the range consisting of immense alluvial deposits, while to the north of the range, between it and the Darling, the alluvial is shallower and rock soon met with; the country between this range and the river appears to me to be very similar to that on the north or north-west of the river.

1516. Then the Manahra range is to the south-east of the Darling? Yes.

1517. Opposite what part of the Darling in the Mount Manahra range? It is about south-east from Wilcannia.

Dividing range between Lachlan and Darling. 1518. You consider that range is a continuation of a range of country that comes east from Cobar? It appears to be a portion of the dividing range between the Lachlan and the Darling.

1519. Do you know of any levels that have been taken there? I have never taken any levels in that district that could be referred to a general datum, but I believe the Railway Department have done so.

Class of country north of Darling and west of Paroo. 1520. Does the same class of country extend across the Darling? North of the Darling and west of the Paroo there are many low ranges, and the sinking there, as I have already stated, is in many cases through rock, the alluvial deposits being much shallower then they are on the great plains. Between the Paroo and the Warrego I do not know the country.

1521. Is that the same line of country you have just been speaking about as to the south-east of the Darling? I am not a geologist, and therefore cannot give a positive opinion, but there appears to me to be a marked difference between the alluvial plains south of the Manahra range and the country to the north-west of the Darling.

Occurrence of older schistose rocks. 1522. I understand you to state that in sinking wells to the north and north-west of that division they go through what geologists term the cretaceous formation? I am informed that they do in many localities, but not all over that section of country. Schistose rocks of an age long antecedent to that formation occur in many places.

1523. And to the south? Through alluvial deposits.

1524. Have you any experience of the country between the Paroo and the Warrego? None.

Country east of the Warrego. 1525. Have you any experience of the country to the east of the Warrego? Yes.

1526. Is the formation there similar to that of the country west of the Paroo? I cannot give a geological opinion, but consider that portions of those districts are similar.

1527. Have you had any experience in sinking wells there? No; I have only constructed tanks in that district.

1528. Have you been further east towards the Barwon? Yes; but no wells or bores have been put down by us in that locality. There are natural springs in the Warrego district.

Natural springs in Warrego district. 1529. In what portion of the country? Between the Darling and Warrego there are several flowing, and numerous mounds indicating the sites of springs now extinct.

Their origin. 1530. What is your opinion in reference to these springs—do you suppose the water to come from some distance? I believe these springs are of comparatively local origin—that the pressure is obtained from the higher lands in the district feeding the drift-beds.

1531. Then you are of opinion that they are to some extent local? I am inclined to think so.

1532. You do not suppose that these springs are caused by the fall of water in Queensland? It is possible, but I am inclined to think they are of more local origin.

Storage of water. 1533. When you get south-east to the Barwon, Gwydir, and Macintyre, is the nature of the country such as to allow of the storage of water by means of artificial dams? You are then in level country, where the features are unfavourable for the storage of large bodies of water having any considerable depth.

1534. Which heads of the Darling do you consider most suitable for such a purpose? I have never been in Queensland, so I can give no opinion as to the feeders in that Colony, but the branches heading up in our coast range could be largely utilized.

1535. You have been to the east of the Darling? Yes; I have been on the Bogan, Castlereagh, Macquarie, and portions of the Namoi.

1536. Have you been on the Gwydir? No.

Nature of country on the Namoi. 1537. What is the nature of the country on the Namoi? The greater part of the country traversed by the Namoi is unfavourable for conserving large bodies of water, and the fall of the country is so slight that water conserved in the drainage channels could only be utilized by pumping. On the upper reaches of this river the conditions become more favourable.

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1538. What I wanted to find out was whether there are any spots where the ranges come together near the river, with comparatively level country above, where lakes of water could be stored or conserved? I do not remember any such places.

1539. Could it be done in reference to the Macquarie or the Castlereagh? Both these rivers, and more particularly the Macquarie, are more favourably conditioned than the Namoi. Macquarie more favourable for storage than Namoi.

1540. And the Bogan? The Bogan, where I know it, is not so well circumstanced for that purpose as is the Macquarie. There are many places where shallow water could be conserved, but depth would be difficult to obtain.

1541. You have been down to the Macquarie Marshes? No. Mr. Dalglish, the late District Surveyor at Dubbo, is well acquainted with that district, and could give you much valuable information on this question.

1542. Do you know any of the country from the Macquarie to the Bogan? Yes; between the Bogan and the Macquarie and the latter river and the Castlereagh the country is on their lower reaches nearly a dead level. Country between Bogan and Castlereagh.

1543. Does that dead level extend as far as the Namoi? I think not.

1544. Do you think, from your knowledge of the country, that it is so level that the whole of these rivers forming the head waters of the Darling could be connected by canal? There are places where some of the rivers could be connected; in fact there are natural connections when the rivers are in flood. Natural connection between Castlereagh, Macquarie, and Bogan.

1545. From the Castlereagh to the Macquarie and Bogan? Yes.

1546. You have lately been at Silverton? Yes.

1547. That is rangy country such as you have before described? Yes. Rangy country at Silverton.

1548. Were you there when they found water by shallow sinking? Yes.

1549. Is it drainage from lands in the neighbourhood? It is merely local.

1550. The sinking is not deep? No; about 40 or 50 feet is the shallowest, and 150 or 160 the deepest, in the neighbourhood of Silverton.

1551. In the case of any wells you have had to do with have you found a flow of water, or what was supposed to be a flow of water? No; but I heard of a case of the kind near Hillston, where a man sank a well to a depth of about 105 feet, when he struck water in an open drift which he stated had a regular flow agreeing with the fall of the country. Flow of water in wells.

1552. Who was it said so? The man was a selector residing about 2 miles from Hillston; he is well known there, but I forget his name.

1553. How far is the Willandra Billabong from Hillston? About 22 miles. Willandra Billabong.

1554. Is that a dry billabong, or generally dry? It is generally dry, its only source of supply being from the Lachlan when in flood.

1555. It flows to the Lachlan in dry periods, and from it when there is a flood in the river? I do not think that is the case, though, under certain conditions, the water for some distance would run back into the Lachlan as that river fell. Messrs. Haines & Whittingham improved the outlet from the Lachlan into the billabong, the channel where it left the river being very ill defined. The cutting made would, unless sluices were provided, allow of a greater reflux when the Lachlan fell, though at the same time there is an actual fall from the river in both the artificial and natural channels. The quantity draining back would be dependent on the excess of the water-level over that of the bottom-level of the off-take. Direction of its current.

1556. Only to that extent? That is all.

1557. Have you had any experience of the country on the Murrumbidgee and the Murray? A good deal more on the former than on the latter river. I was in that district during the great flood of 1870 or 1871, and saw the way in which the waters of the Murrumbidgee, Lachlan, and Darling spread out over the country. The Lachlan waters extended out to within about 20 miles of the Manahra range. Flood of 1870 or 1871.

1558. As a matter of fact, the whole country between the Lachlan and Darling was covered with water? There could not have been more than about 30 or 40 miles between them, but the whole country was not under water, as the flood was confined to certain courses by the natural features of the country.

1559. Then the water reaches between the Lachlan and the Darling, and fills up the country right across from the Lachlan to the Darling? I did not say right across, about 30 or 40 miles of high land must have divided them. The country between the Lachlan and the Willandra and thence north-easterly is so level that the water could be taken in almost any direction. Level country between Lachlan and Willandra.

1560. *Mr. Franklin.*] You refer to the Willandra Creek, which is about one-third of the distance between the Lachlan and the Darling? Yes, the Willandra creek floods; they are Lachlan River water.

1561. Do you think it would be an advantage to lock the off-take of the Willandra Creek with weirs and under-sluices to retain the flood-water? I think regulating works would be an advantage, also a weir in the Lachlan to throw the water into the Willandra at half-flood; but to take full advantage of the river when high enough to flow into this billabong the *régime* of the channel should be improved, to allow of the water being carried well forward. Locking the off-take of the Willandra.

1562. Then you think that an instrumental examination would be of benefit there? Most decidedly, in all cases when a little assistance to Nature will achieve great results.

1563. The country being so level, if you get a great head at flood-times you could keep a good quantity in store? Yes, but it must not be forgotten that the storage would be rather shallow. Storage at flood-times.

1564. Do you know any special features on the upper part of the Macintyre or Macquarie where an instrumental examination would be beneficial with a view to form a large storage of water? Yes, but my recollection will not allow of my naming any particular spots; but no one travelling up these rivers could fail to notice the favourable features that exist for carrying out such works. Spots for storage on the Upper Macintyre and Macquarie.

1565. *President.*] What distance do you suppose the water could be diverted across that flat country from the Lachlan through the Willandra Billabong westwards? About 150 miles; I have seen the waters running into Barney's Swamp, and the waters have been known to run out much further. Distance the water will reach by the Willandra.

1566. Do you know anything of the lower portion of the Darling below Menindie? I have travelled along that section of the river, but cannot give any information that will be of service to you.

1567. You cannot give us any information as to the possibility of storing or diverting the water into the large anabranch? I do not know enough of the locality to care about giving a decided opinion, but from what I remember of the place I think that it could easily be done if proper headworks were constructed at the off-take from the Darling. Storing or diverting water into anabranches of Darling.

1568. From Menindie towards Bourke are there many places where the waters of the Darling could be diverted into the anabranches and be carried any distance from the river? I have no personal knowledge of

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of any cases where the Darling waters could be diverted into these natural channels and carried any great distance back from the rivers, but there are many cases where water could be turned into these channels and into shallow so-called lakes fed by them.

Depth of permanent tanks. 1569. In tank excavation what depth do you think a permanent tank should be made? Not less than 18 feet.

Batter of tank. 1570. And what batter do you give? We vary it according to the nature of the soil, but we now give a flatter batter than in our earlier works; then they were as steep as 1 to 1, and now in some cases we make them 2½ to 1.

Evaporation from tanks. 1571. Have you any knowledge of the evaporation that takes place in tanks made by Government? We have never measured it, and it would be a difficult thing to allow for loss due to evaporation and that due to percolation. The evaporation too must always be variable in different works, being greatly dependent on the surrounding conditions in each case, and these are seldom the same. Generally speaking, in a tank containing 18 feet of water I do not think the evaporation would exceed 4 or 5 feet.

1572. What would it be in shallower tanks? That is dependent on many conditions, and largely so on the depth. Very shallow water will evaporate at a more rapid rate than deeper water. The nature of the soil too, has, in my opinion, an influence on the temperature and evaporation.

1573. You have no knowledge of the Paroo? No

1574. Nor of the northern rivers running into the Darling? No.

Information by Commission visiting various districts. 1575. *Mr. Franklin.*] Do you think that as a Commission we could gain much information by visiting the various districts, from the pastoral residents, as to the improvements they have made on the runs—would they volunteer information? I believe they would be glad to give it and assist you in every way.

Irrigation work at Grungle station. 1576. Do you know any particular runs about Hay where they have made advances in the storage of water and in irrigation? I do not know where they have made any advances in storage, but at Grungle, a station belonging to Mr. Learmouth, irrigation work has been carried out, and Mr. Mair, the General Manager, kindly gave me his experience in a letter which I have embodied in the paper I handed in as evidence.

Trial shafts to test level of water. 1577. Do you think it possible to make arrangements with the pastoral tenants to sink trial shafts to test the level of the water? I never tried them; I question whether they would like being troubled in that way. I also question whether you will find the work necessary, as the lessees have so many shafts sunk that in all probability you will be able to obtain the information you require from existing works.

Best method of conserving water by weirs or dams. 1578. *Mr. M'Mordie.*] Can you suggest the best method of conserving water in these rivers by weirs or dams, or its diversion into anabranches or lakes? Where the natural conditions are favourable they should be taken advantage of; but it must be remembered that in conserving waters in anabranches and lakes you are as a general rule conserving it in country where the fall is so small that you will be unable to distribute the water without pumping appliances. I therefore think that though from some points of view great advantages will be gained by such conservation, still for the purposes of irrigation the water should be impounded where there is sufficient fall in the country to allow of its being drawn off and distributed by gravitation. In such localities too the natural features are more favourable for economical artificial storage. There are many places on the upper reaches of our rivers where weirs could be cheaply and safely constructed that would impound very large bodies of water.

1579. You are not afraid of silt in this weir? On the lower courses of our rivers it might be a difficulty, but not to near the same extent on the upper reaches, where, from the nature of the country through which the rivers flow, a smaller quantity of silt is brought down, and where the facilities for scouring are greater.

1580. Do you recommend permanent or movable weirs? That depends on special conditions.

The Commission should direct their attention to the whole Colony. 1581. Do you know to what places the Commission could profitably direct their attention, having regard to the objects they have in view? The question is of so broad and national a character that I am of opinion that the Commission should direct their attention to the whole Colony, more particularly to the western falls, and then examine the nature of all our river systems and of the country the water is to be diverted on to.

1582. You have no knowledge of the Darling? Not of the upper and north-eastern tributaries.

Character of wells north of the Darling. 1583. *Mr. Gipps.*] What is the character of the wells north of the Darling, as regards their artesian properties or otherwise—is it of a soakage or artesian quality? They are not artesian.

1584. What is the average depth of them? Speaking roughly, I would say about 150 or 160 feet.

1585. What do you consider would be about the height of the surface there above the sea-level? Wilcannia is I believe about 300 feet above sea-level; running out north-west the country excepting the ranges would be about the same elevation, that is, on a course transverse to the axis of the river.

Positive and negative artesian supply. 1586. What do you understand by artesian water? Positive artesian is where the water when tapped rises above the surface, and a negative artesian supply is where the water when tapped rises above its confined level, but not above the surface.

1587. Have you travelled on the Murrumbidgee? Yes.

1588. On the Upper Murrumbidgee? Yes.

Character of bed of the Murrumbidgee. 1589. What is the character of the bed of the river? On the upper reaches the river flows in a well-defined valley, the ranges being generally rocky, and in some places closing in and confining the flow to a rocky gorge, in other places opening out with broad flats through which the river runs.

1590. Is the Murrumbidgee a permanent river? Yes, I have never seen it stop running.

Murrumbidgee fed by snow and springs. 1591. *Mr. Franklin.*] It is snow-fed? Yes, and it is also fed by many springs.

1592. *Mr. Gipps.*] Have you any idea of the quantity of water supplied to the Murrumbidgee near Cooma? No, nor am I aware that the flow was ever gauged.

1593. Does it flow in a good stream at that distance from the head? Yes.

Chief supplying tributaries. 1594. Where does it receive its chief supply after leaving the mountains? From the Bredbo, Umaralla, Queanbeyan, Molonglo, Goodradigbee, and Tumut Rivers.

1595. Do you know anything about the tributary rivers on the eastern bank—are they permanent or otherwise? Permanent as far as my knowledge goes.

1596. Do they bring down any silt in flood-time, or are they clear? Some of them send down silt in flood-time.

1597. Have you seen the Goodradigbee and Tumut Rivers in flood? No; I have seen them in freshes.

Places for weirs on tributaries of the Murrumbidgee. 1598. *Mr. Franklin.*] Do you know any point on the Tumut River before its junction with the Murrumbidgee where a dam might be put? No; my knowledge of the rivers is general, and without being able to indicate the exact place I know that sites exist where weirs could be constructed.

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1599. You do not know that the bed slope of the Tumut is much greater than that of the Murrumbidgee? No, I do not; it must depend upon what section of the Murrumbidgee it is compared with. As you get into the mountains the fall of course increases.

Supply of country between Junee and Cootamundra.

1600. I take the great rise from Gundagai to the Tumut and the fall of the river into the Murrumbidgee; are there any points on the Murrumbidgee where the water could be dammed and conveyed across from the Murrumbidgee into the flat country between Junee and Cootamundra? That is a question of level, but the rise must be very great above Junee.

Nature of bed of the Murrumbidgee

1601. *Mr. Gipps.*] Where does the rocky bed of the Murrumbidgee terminate? Where the river enters on the alluvial plains, above that rock is frequently met with, alternating however with an alluvial channel.

1602. What is the average fall of the Murrumbidgee do you think, up to Yass? I have never levelled it, and cannot possibly say.

1603. You do not know the quantity of water the Murrumbidgee discharges at Yass? No, nor am I aware that the river has been gauged there.

Diversion of Murrumbidgee into Lake George.

1604. Do you think it advisable to divert the Murrumbidgee at Cooma into Lake George? That is a question that ought not to be recklessly answered. It would require a very accurate knowledge of the country and of the levels to be able to give an opinion on that point.

1605. Would it be advisable, if it could be done, to do it, for irrigation purposes? It would depend to a great extent on whether the water could be economically brought there and then economically distributed.

1606. Are there any positions you could recommend on the Murrumbidgee for lakes? No.

Darling River:

1607. Have you travelled up the Darling River? Yes.

1608. From what point? From Wentworth to Bourke, and from Bourke to Walgett and the Barwon.

its bed

1609. What is the character of the river-bed? Alluvial, with occasional rocky bars.

1610. What was about the average width of the banks? I have never measured them.

1611. What are they at the flood-level? I would think they were about 300 or 400 feet.

1612. And at the bottom? 150 feet at the outside.

1613. What would be the average depth of the banks at summer level? I do not know; it is scarcely a fair question, but I would roughly estimate it at about 30 feet.

its summer level:

1614. What do you call summer level in the Darling? Lowest running level.

1615. What is the lowest summer level? Just before it ceases to flow; it cannot be referred to any standard datum.

1616. It ceases to flow in summer-time? I believe it does, but I have never seen it in that state.

at Wentworth:

1617. What is the lowest you have known the summer level of the Darling to be at Wentworth? That I could not tell, because there is a considerable depth there, and it is difficult to say when the river is flowing or not.

at Menindie:

1618. At Menindie? The lowest I have seen there is about 3 or 4 feet. These answers are not from measurements, but are merely guesses at truth.

at Wilcannia:

1619. At Wilcannia? I have seen it there so low that you could walk across the river on the rocky bars, where it might have been 6 inches.

1620. What would be the breadth there? At such a time the water would be flowing only in the lower gaps of the bar.

1621. About 10 or 20 feet? I would not venture to answer.

its fall.

1622. You know the average fall of the Darling? I believe it is about 3 inches in a mile.

1623. Have you seen the Murray at the junction of the Darling? Yes.

1624. Have you seen it at flood-time? Not in full flood, but I have seen it at about half-flood.

1625. Did it appear to raise the Murray water at all—was the water in the Murray higher below the junction than above it? That I could not tell, because I did not take any levels, and could not perceive the small amount of difference that might possibly exist.

Drainage from Lake George.

1626. *President.*] Do you know of any levels taken in the drainage from Lake George? No; I heard there was a scheme afoot to drain it.

1627. You cannot give any information about the levels? I believe the promoters have been furnished with that information by their engineer.

1628. Have you any further information to give the Commission before closing you evidence? I think not.

Extension of tank routes.

1629. *Mr. Franklin.*] Have you any conceived plan for any lines for the extension of tank routes through the country? The lines are not fixed by my Department, but by the Stock Branch of the Mines Department.

1630. From experience do you know which particular lines of the country you would recommend for fixing tanks? It is not a matter coming under me for consideration—it is vested in the Stock Branch, and they have always dealt with it.

Machinery for excavating tanks.

1631. In excavating these tanks what machinery do you use—is it the practice to use steam scoops? We have a steam scoop at work near Nymagie, but most of the work is done by the ordinary bullock plough and scoop.

1632. You have not adopted any machinery used in South Australia? No; it seems to cost as much to work with steam as with animal power.

1633. Can you sink to an equal depth at the same cost? No; up to 18 feet we can, but beyond that I believe the steam plant lessens the cost.

Slopes of tanks.

1634. *Mr. M'Mordie.*] They have to work a very flat slope? Yes; supposing an oblong tank is being excavated, the long sides would be given slopes of (say) 2 to 1, and the end slopes, up and down which the scoop entered and left the tank, would be given an easy slope of (say) 5 to 1.

Loss of water through flat slopes.

1635. *President.*] I understand that that is an objection? Yes, unless you intend to water stock in the tank instead of in troughing supplied from the tank by pumping. All shallow water evaporates more readily than deep, hence flat slopes are a source of loss.

1636. You consider that a tank should never have a greater slope than to ensure the banks not giving way? Most decidedly.

1637. *Mr. Franklin.*] Would there be a great saving in using steam appliances if we were excavating on a large scale without refinement in the slopes? I think so, where there was a great amount of concentrated work.

THURSDAY, 9 OCTOBER, 1884.

Present:—

MR. BARTON, M.P.,	MR. LYNE, M.P.,
MR. DONKIN, J.P.,	MR. MURRAY, M.P.,
MR. FRANKLIN, C.E.,	MR. M'MORDIE, B.E.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. Cecil W. Darley called in and examined:—

Mr. C. W. Darley. 9 Oct., 1884.

1638. *President.*] What is your profession? I am a civil engineer.
1639. You are principal Assistant Engineer of the Harbours and Rivers Department? Yes.
1640. You visited America a short time ago? Last year.
1641. You received instructions from the Government? I was asked, in passing through, to look into the subject of boring and drilling—to see how it was done there, with the object of presenting a report upon the subject.
1642. And you have presented that report? Yes.
1643. It has been published in pamphlet form, I believe? Yes; I have distributed copies to members of the Commission. (*Appendix* J 1.)
1644. In this pamphlet have you dealt with any subject apart from the system of boring in the United States? No; simply with boring and drilling.
1645. And the whole of the information which you obtained while in America is contained in the pamphlet? On that subject.
1646. Did you obtain any other information which would be of service to the Commission? I think not.
1647. Did you obtain any information as to the storage of water? No.
1648. Nor upon any system of irrigation on a small or large scale? No; I did not go to any irrigated portion of the country but California. That I refer to in my report.

Resemblance of country in California and in Australia.

1649. Is the country which you visited at all like Australia in its natural features? I think so; that portion of California which is contained in the San Joaquin Valley is very like. It is a dry, level tract of country, with mountains on either side. It is bounded by the Sierra Nevadas to the east, and the coast range lying between the valley and the coast. It is a wide valley. Ordinarily the rainfall is only from 8 to 10 inches in the year. Before they adopted a system of irrigation this country was almost valueless; five years ago the land was to be purchased for about 1 dollar an acre.

Value of land since irrigated.

1650. What is its value since it has been irrigated? It has gone up to from £50 to £60 an acre.

Irrigation from wells and by canal.

1651. Is the irrigation carried on by means of wells? It was first carried on by means of canals from the heads of rivers. The Canal Companies commenced in this way, but they have now covered as much country as they can with the quantity of water at their disposal. Now the landowners are extending the irrigation by means of wells sunk over the whole area.

Private enterprise.

1652. In carrying out this system of irrigation did the Government enter into a contract with Companies? No, it was done entirely by private enterprise.

King's River Company.

The Government gave to certain parties the right to take the water. For instance, there is the King's River Company; they have a right to tap the river, and they took every drop out of its bed and brought it down by means of canals above the banks. A portion of the water is brought down in flumes. There is a good deal of pine country at the head of the river, and there are saw-mills there. The water in these flumes is made to carry down the timber. The flumes are V-shaped, and the water after bringing the timber down to Fresno is used for irrigation purposes. The greater part of the country is irrigated by means of canals from the head of the King's River. The Company have a right to the water, and they lease it to landholders. They have a system of leasing; they can grant a ninety-nine years' lease, undertaking to supply the water for that time.

Regulations.

1653. Is this provided for by legislation? Yes. I had not time to go into the matter very much, but I would suggest that you should send over for the Act and particulars of one of these Companies; you would then be able to see their regulations.
1654. *Mr. Franklin.*] What would be the best Company to send to? I think the Company called the King's River Canal Company.
1655. *President.*] Do you know whether the Government let any water rights? I do not think so—I do not think they interfere.
1656. Do they give any rights to the land? Not in this district; all the land is purchased, and the parties arrange with the Canal Companies; but, as I have said, they have let out all the water they have.

Irrigation by artesian water.

An enormous area of country is being irrigated and brought into use by means of artesian water.
1657. Is that done by private enterprise? The farmers contract with a number of contractors; they contract to put down a bore for so much, guaranteeing the water. A blacksmith named Mull is one of these contractors. It is done entirely by private enterprise—the Government do not interfere at all.
1658. Is the country in which this system is carried out a level country? Yes.
1659. Does the water rise above the surface when it is struck by these bores? Yes. The holes are cased; when water is found they stop the case and cut it off about 4 feet above the surface. In some cases I have seen the water 3½ inches deep over the lips of the case. If you refer to plate 10 in the pamphlet, you will see an illustration of the method adopted for impounding and distributing the water at the surface. They form an earthen embankment enclosing a few acres of ground, the tube being in the centre. The water flows until it reaches the top of the embankment, and it is then conveyed in various directions by means of elevated ditches. The farms are divided into what they call "checks." Each of the checks is levelled off.
1660. Have they a system of draining the water over the surface of these checks? The water is simply stopped at a certain point, and the ground being porous it disappears.
1661. The soil is of a sandy nature? It is very productive. In its natural state it will hardly grow grass. It is a great bare wilderness, with little tufts here and there of a brush similar to that which is found in our salt-bush country.
1662. Is it necessary to expose the artesian water to the air before it is allowed to go over the land? I do not think it is necessary. The water is stored and conducted to the portion of land to be irrigated in the

Mr. C. W. Darley. 9 Oct., 1884.

the manner I have described. They can store several days' supply. I saw plenty of cases in which the water was wanted for pasture land, and in which the water was allowed to run directly over the surface—there were no flumes.

1663. I suppose the system could be carried out by pumping up the water? Yes. Over a great deal of the country they have water at two levels. In one case they find the water at about 40 feet below the surface. That is not artesian—that is, it will not rise above the surface—but it is abundant and fairly good. It is not the best water. Below this level they pass through an impervious stratum for about 250 feet, and they then get into another gravel bed, where they tap water which is artesian. On many of the small farms in the valley hundreds of acres are under fruit; there are apple and plum orchards and tomato gardens. There they have not gone to the expense of sinking to the lower water—they are satisfied with the upper water. They put down a tube well in a few hours, and it can be done at a trifling cost. One man told me that he had put down three or four in a day. They put on a windmill and pump up the water. The water is run along to the roots of the trees. They have tanks for storing, and if they are not using the water they lay off the windmill. In a certain part of the year they require to run the water along the roots of the vines, especially during the first two or three years of their growth. Pumping of water by windmills.

1664. It is a vine country? Yes. I visited one vineyard which had just been started by a Mr. Barton, close to Fresno. (*Appendix* J 2.) He had taken up 640 acres about five years before I was there. When I visited the vineyard he had 500 acres under vine. The country when he took it up was exactly like the country to be seen outside of his fence. His vineyard was a little oasis in the desert. He had water from the King's River Canal Company. Outside the country was sandy, and was covered with little burrows. There are a vast number of ground squirrels—they occupy all the country. There are also rattlesnakes and owls frequenting the same vales, but the irrigation drives them all away. Mr. Barton had about 100 acres laid out in checks for green crops; the finest crop of wheat I ever saw was growing there. Mr. Barton's irrigated vineyard.

1665. *Mr. M'Mordie.*] What is the area of these checks? It depends largely upon the contour of the ground. If you have much slope, you must make them small and get them nearly level. Mr. Barton's were about 400 feet square. His country is pretty level; some were 500 feet. The wheat was growing in checks, some of which were about 600 feet by 400 feet. Area of checks

1666. *President.*] Have you had much experience as a traveller in Australia? Not in the dry country.

1667. Do you think the nature of the country corresponds sufficiently to enable the same system of irrigation to be carried out in both places? From the descriptions I have heard of the Paroo and Warrego country, I should say it was very similar to the country in which this irrigation is carried on. Certainly it is not so near to the mountains as the country in California. There they know where the water comes from. There the Sierra Nevadas are immediately above, and they are snow-capped throughout the winter, storing up the water for the summer supply. Californian irrigation system adaptable in Australia.

1668. A great deal of the water is snow-water? Yes, there is a natural reservoir on the heights of the Nevadas. The water sinks down and finds its way to the sub-strata. There must be a vast quantity of water sinking down in this Colony—it is well known that the rivers do not carry off the rainfall.

1669. As far as your experience goes, do you think that the river-water could be distributed in the manner you have described? I do not think so. I do not feel myself qualified to give an opinion on the matter. The country I think is too great in extent; you might distribute the water over a small area near the heads of the rivers; I think you would not be able to carry the water the necessary distance. You may be able to do something near the heads of the rivers—at the head of the Gwydir, for instance. Distribution of river-water.

1670. Is the system of boring in America very complete? Yes, they have brought it to great perfection. Price of boring in America.

1671. Have you given in this pamphlet any estimate of the cost? Yes, I have given the prices of two or three machines.

1672. And the price per foot for boring? Yes.

1673. *Mr. M'Mordie.*] What is the rate of wages paid there? It is as nearly as possible the rate which we pay here.

1674. *Mr. Murray.*] And they employ white labour? Yes. There are standard rates for boring throughout the country. The rates which rule in California rule also in Colorado, where I also saw some boring going on. You will find the rates stated on page 22 of my report. The first 100 feet will cost 2s. per foot; from 200 to 300 feet the cost is 3s. per foot; from 300 to 400 feet 4s. a foot, and so on, making the cost for boring a hole 600 feet deep, £102 10s. To that, of course, you must add the cost of casing.

1675. Would that be great? It costs about 3s. a foot, making the cost for 600 feet £90. There it is the practice for the farmers to board the men who do this work. Say there are three men employed for six weeks at 2s. per day, the cost would be £12 12s. The total cost of a 600-feet hole would thus be £204 2s., or 6s. 10d. per lineal foot. They would start with a 7-inch drill; but it is not often that you can get a 7-inch casing of thin sheet iron deeper than 300 feet—the friction is too great, and it is apt to be crushed. They would stop the 7-inch casing at about 300 feet and continue with a 6-inch case. When the 6-inch casing reached the bottom, and upon completion of the bore, it is cut off a few feet above the bottom of the 7-inch casing and the upper portion withdrawn to be used again. It appears to be a 7-inch hole, but in reality it is only 7 inches for 300 feet. The secret of getting the water is to be found in the casing. They bore in some parts of the country without the casing, but they do not get artesian water. The same thing is overlooked in this country. I have heard of water being tapped at a low level rising up to a certain height and not flowing any more. If the hole had been cased the water would probably have risen to the surface. In California they meet with a permeable stratum at about 40 feet below the surface, and below this again an impermeable clay for about 250 feet. They bore inside the casing. A steel shoe is put at the bottom, and they make it cut its own way down, removing about a quarter of an inch all round the hole. That makes the tube get through the impermeable strata till they come to good water below. Suppose they did not case the hole right down, the water would rise to a certain point, but it would disperse with the upper water. Casing.

1676. They obviate that difficulty by putting the casing right through it to a particular depth? Yes. The words "boring" and "drilling" have a distinct meaning; in that country they bore in the alluvial country, and in the rocky country they drill. The case is put well into the rock, and it thus cuts off the upper water. I explained the process in my report.

1677. *Mr. M'Mordie.*] Did you look at the canal irrigation at Colorado? I had no time to study it, but I saw some of the canals.

1678. *President.*] Do the farmers incur any risk in these contracts—suppose the contractor does not find the water? They have bored sufficiently to know exactly where to find the water; the contractor takes all the risk of getting the water. Arrangements with contractor.

1679.

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1679. And of breakages? Yes, of everything. If he does not get water the farmer does not pay. I saw some holes which had failed, and in which the tubes had been crushed. The price pays the contractors handsomely—I could see that from the eagerness with which they were competing for the work. In some cases I believe they did the boring for a third of the prices which I have quoted, thus making a profit of two-thirds of the contract rate for boring. I saw a place near Stockton where a bore was being put down by means of the hydraulic boring apparatus. The work was very rapid. The man had been upon the ground twelve days with his machine. He had a steam-engine for pumping and running the machinery. His book time showed eleven days and three-quarters, and the tube was then 524 feet below the surface. In that time he had had to erect his machinery and put down a well 40 feet to get water for his engine; and he had had to make his tank. There must have been two days' preliminary surface work before he got his machine started.

Hydraulic boring.

1680. Was it soft sinking? Gravel and alluvial. When I was there he was going through a gravel-bed, and was washing up stones the size of walnuts.

1681. Where did he get his water from? He had to put down a well.

Appliances used in California suitable in Australia.

1682. Considering that the wages here are similar to those paid in the United States, that the country is similar, and that the rainfall is similar, I suppose that the appliances used in California could in many instances be brought into use here? I think they are admirably suited to this country. Some of the machines have hand gear. Then there is horse power, which I should recommend for this country.

1683. You would recommend that in sinking, especially for artesian water, there should be boring, not open sinking, and that it should be tubed? Yes, there certainly should not be open sinking.

American makers of appliances.

1684. *Mr. Franklin.*] Do you know of any firm in America who have devoted their attention to the making and improving of these appliances? Yes, I know two at least—the Gillespie Tool Company and the Pierce Well-excavating Company.

1685. They are acknowledged to have the best boring appliances? Yes, they have about the best. I may mention that the tiffen is only used for the surface water.

Good opening for mechanics in this country.

1686. *President.*] Do you think it would be economical on the part of the Government or of private individuals to enter into a contract with any of these Companies in America? I think there is a good opening for an intelligent man with a little capital—a good mechanic. I noticed that the whole of the men working these machines were mechanics, chiefly blacksmiths, who could mend their own tools, or who, in the case of emergency, could make tools for a particular kind of work. A man of that kind, with sufficient capital to obtain the plant, would make a certain fortune, I think, in this country, by contracting with people to sink holes.

1687. *Mr. Donkin.*] It would be necessary that they should be practical men in this Colony, because they would have to work in such isolated places? Quite so.

Crops produced.

1688. *President.*] What are the crops which the farmers produce on this irrigated land? It is so suitable for fruit-growing that they are devoting it to that purpose as much as possible, but I saw some good crops of lucerne; they also grow splendid crops of barley, oats, and wheat; here and there you will find a man with as many as 100 acres of tomatoes.

Annual rates paid to the Flume Companies.

1689. *Mr. Barton.*] Do you know the quantity of water used per acre for this irrigation? The water is sold by the Flume Companies at 5 dollars per annum rent.

1690. Is that per acre? Per acre; and 100 dollars per foot—that is, a miner's foot. A miner's inch is an inch of water discharged through a notch 1 inch square in a 2-inch plank, and under 6 inches of head. A miner's inch will discharge 2,267 gallons in twenty-four hours. A farmer would be entitled to just twelve times the quantity for a foot.

1691. *President.*] Is that the system of gauge adopted for distribution? Yes.

Gauge of water used.

1692. What is the gauge to ascertain the quantity of water used? It is very rough; the quantity is guessed—they do not measure it at all. In the first few years the farmer will probably use more than he is entitled to, but afterwards he will not require to use so much as the quantity to which he is entitled. They know that, and the quantity used therefore is not gauged.

Discharge of water from the flumes.

1693. Supposing the flumes passed through country where irrigation is required, in what way do they discharge the water from the flumes into the distributaries for watering the land? They bank up the flumes, and they have ordinary wooden sills which pull up.

1694. *Mr. Barton.*] You do not know the quantity of water they use for their crops—that is, the quantity used for each irrigation? I did not go fully into that.

Salt deposits.

1695. *Mr. Franklin.*] Did you hear any complaints of a salt deposit on the irrigated land? No.

Total cost per acre per annum for irrigation.

1696. *President.*] Do you know the total cost per acre per annum for irrigation? As I just now said, it comes to 5 dollars an acre rent per year, and 100 dollars per foot of water per section. It takes 4 feet, at 400 dollars, for the 640 acres, or £80 for a section; adding the 5 dollars per annum rent, the cost would be £1 3s. an acre.

Fluctuation of discharge from the wells.

1697. Do you know whether there is any great fluctuation in the discharge from the wells in the San Joaquin Valley? It comes pretty steadily. I asked some of the farmers whether upon putting down a second well pretty close to one which was already running it would slack off the supply from that well; but it appears that the supply is not stopped—it seems to run pretty constantly.

1698. Is it pretty regular in all seasons? It is pretty regular, I believe, all through the year.

Distance between wells and water soakage area in the hills.

1699. Is the distance known between the wells and the outcrop of the water-bearing strata on the hills? I think they have the information, but I was not able to get it. There was an elaborate report in reference to that portion of California. I thought that I should be able to obtain a copy in the Colony, and I did not bring one away with me, but I find that the only copy in this Colony was burned in the Garden Palace fire.

1700. Have you any idea of the distance? I suppose it would average from 10 to 14 miles to the hills—That is from the places where they get the artesian water.

1701. *Mr. Donkin.*] What is the greatest distance away? There are parts of the country when you go south—in Texas for instance—where the hills are some hundreds of miles away from the nearest place at which they get artesian water.

1702. *President.*] How long is it since they first discovered this artesian supply in the San Joaquin Valley? About three or four years ago.

Results of shallow sinking.

1703. Did you obtain any information as to the result of the shallow sinking—that is, before they adopted the system of casing, when the sinkings were open—had they any difficulty then in obtaining permanent water? I do not think they ever attempted the open sinking.

1704.

1704. I suppose they would not have obtained a constant supply? The upper water, as I have already explained, does not rise to the surface—they have to pump it. Looking out of a railway carriage window passing through parts of the country, one may see in some cases probably 100 windmills at one view. Mr. C. W. Darley. 9 Oct., 1884.

1705. You did not hear that in any case before adopting the casing of wells they sank to the depth to which they are now sinking for artesian water? No.

1706. What was the deepest well you saw? In California about 550 feet; I saw some afterwards 1,200 and 1,400 feet. Deepest wells sunk by drilling.

1707. Were they sunk by boring? No; I saw one put down at Oaklands by drilling to a depth of 1,400 feet.

1708. What machinery was used? The Pennsylvania rig. Machinery used.

1709. Are you aware whether the Canal Company of which you have spoken obtained any concession of land? I do not think so. Income of Canal Companies.

1710. They obtained the whole of their income by disposing of the water? Yes.

1711. Does it seem to be a prosperous Company? I could not find out much about it except what Mr. Barton told me; they seemed to be doing pretty well.

1712. *Mr. Donkin.*] You think that there ought not to be a great difference in the contract prices for boring and drilling between the two countries? I do not think so. Contract prices for boring and drilling.

1713. At present there is a contractor in Sydney who has put down some twenty wells, averaging from 50 to 200 feet—he charges 15s. per foot for tiffen boring? I should say either that he made a great deal of money or he did not know his work, or that he must have bad tools.

1714. The Pierce Company say that they will bore to 3,000 feet at a charge of £2 a foot? Of course the price increases as you increase the depth, but in their own country they bore at a much less cost than that. I would refer you to the pamphlet issued by the Gillespie Tool Company, which I will put in as an exhibit. (*Appendix* J 3.) I would suggest that a man—that is a competent mechanic—with a machine, should be obtained from both the Gillespie Tool Company and from the Pierce Well-excavating Company. If both Companies were competing, they would take care to send a first-class machine and a first-class man in charge of it.

Mr. Thomas Kingsmill Abbott called in and examined:—

1715. *President.*] You are a Stipendiary Magistrate? Yes. Mr. T. K. Abbott. 9 Oct., 1884.

1716. You are at present residing in Sydney? Yes.

1717. But formerly at Gunnedah? I lived at Gunnedah from 1867 to 1882.

1718. When you were living there, I believe you took considerable interest in obtaining particulars in reference to the wells sunk in that district? I collected some information respecting wells in the county of Pottinger; I could not get information as to the whole district. Information on wells in the county of Pottinger.

1719. Then the information which you have obtained is confined to one county? Yes.

1720. After obtaining this information you wrote a paper, I believe, which was read before the Royal Society? (*Appendix* K 1.) Yes, by Mr. Russell.

1721. That was in 1880: did you afterwards follow up your inquiries, or did you obtain any further information which would be of use to us? No, I do not think I have much more information. I have some information about a few wells in addition to those mentioned in the paper. You will see that it has a map attached to it showing the position of the wells. (*Appendix* K 2.) I think I have obtained information about twenty or thirty more wells, a few in the counties of Nandewar and Buckland.

1722. What is the nature of the county? The county of Pottinger consists of plains of black soil. Nature of soil in county of Pottinger.

1723. Is it hilly or level? The plains are nearly all level, or there are only slight undulations; there are basaltic mountains running through the district.

1724. Over what extent does your information extend—how many miles? The extent of country would be about 80 miles by 90.

1725. Nearly 100 miles square? Yes.

1726. Were there any artesian wells there? Several. No. 20 at Bando is one. Artesian wells.

1727. That is an open well, that is it is not cased in? It is slabbed.

1728. But not watertight? Oh no.

1729. Has it been ascertained where the water comes from in great distances? The well is situated on the slope of a basaltic range, and further on on the same slope to the southward, there is a place called Tambar Springs where the water comes to the surface. To the north there is a place called Garrawilla, where the water also comes to the surface. Tambar Springs.

1730. In these cases the water is artesian? Yes. At Garrawilla it is a spring. There is a dam filled by it which washes about 50,000 sheep. No. 58 is also a well in which the water flows over the surface. Garrawilla Spring.

1731. *Mr. Franklin.*] I observe from the map that there is a range of hills on the western side of this area? This map is taken from the county map on the scale of 2 miles to the inch. The range marked really represents no very perceptible rise. In different places there are high mountains, but between Cox's Creek and the Castlereagh the ridge dividing the fall of the water is almost imperceptible. The range dividing the waterfall.

1732. *President.*] What is the height of the range above the spot where the water appears? Do you mean at Bando? Its height.

1733. Yes, what is the height there? The highest point is 600 or 700 feet above the well itself, and the well is about 50 feet above the level of the plains, that is, above the banks of Cox's Creek.

1734. Do I understand you to say that the range is about 600 feet above the well? Yes.

1735. What is the nature of the soil? Black soil, and the range is broken basalt. Black soil and broken basalt range.

1736. In sinking the well did they go through black soil all the way? There was pipeclay at the surface, but the strata was unknown. The well overflowed fourteen or fifteen years ago in consequence, it was said, of ringbarking. That is all the information I could obtain about it. Pipeclay.

1737. *Mr. Donkin.*] What depth is the well? 90 feet.

1738. You do not know what underlies the black soil there? No.

1739. Do you know the difference of the level between the surface of this well and the summer level of the Namoi River? I could not say. I should think it would not be more than 90 or 100 feet. Difference of water level in the well and in the Namoi.

1740. Do you know the height of most of the wells in the district? You mean as regards the plain?

1741. Yes, what would it be? I know the position of every well marked on the plan—I have been to nearly every one of them.

1742.

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1742. Do you know the height of the well above the sea-level? I could give the height of most of the wells with regard to the level of Gunnedah, and that is about 890 feet above the sea-level.

1743. And you know the respective heights of the wells as regards Gunnedah? Almost all of them.

Height of wells above sea level.

1744. Is there any great difference between the height of the various wells as compared with each other? There is a considerable difference. No. 2 is at the head of Ulaman Creek; that would be about 100 feet higher than No. 20 at Bando. The springs at Tambar on the side of the mountain are 200 feet higher than the plain.

Discharge of water from Tambar Springs.

1745. Is there any great discharge of water from these springs? About 400 to 600 gallons an hour; it runs across the road. The water discharge varies according to the weather; in dry days it almost ceases to run—in damp dull days it runs strongly.

1746. A letter was written a short time ago to the Under Secretary for Mines and referred to us, in which it was stated that a spring, I think somewhere in that neighbourhood, was affected by the moon: do you know whether these springs or any other springs in the district to which you refer are affected in that way? I never heard of it.

Lunar and atmospheric influence on the wells.

1747. But they are affected if the atmosphere is moist? Yes, there is a marked difference in the spring between moist days or dull days and on bright sunshiny days.

1748. *Mr. Donkin.*] It has been said that the moon in a certain position has a certain influence upon the level of the water in one of these springs: have you observed any influence of that kind? I never noticed it.

Height of the wells in comparison with the level at Gunnedah.

1749. *President.*] You say you know the height of most of the wells comparing them with the level at Gunnedah: what is the average height of the wells going right through the whole district? Do you mean the height of the surface?

1750. I mean the height above Gunnedah? Some of them would be lower than Gunnedah, but there are so many wells that it is difficult to take an average.

1751. Would there be any great difference between them? Not a great difference. In the case of all the wells on the Breeza Plain the surface would be only a few feet higher than Gunnedah. They would range, I suppose, from 850 to 1,150 feet above the sea-level.

The Namoi River.

1752. Are you well acquainted with the Namoi River? Yes, I have been along the Namoi.

Nature of the bed.

1753. What is the nature of the soil in the bed? It alters as you proceed down stream; the further you go, the finer and softer the soil becomes. At Gunnedah the bed of the Namoi is gravel; at places there are large boulders which have been brought down from above.

1754. It gets softer as you go to the Darling? Yes, above Carroll it enters the mountains; there it changes its name—it is called the Macdonald.

Natural places along the Namoi for storing water.

1755. Are there any natural places along the Namoi where by diverting the water or by making weirs or dams any quantity could be stored? I do not know of any place beyond Narrabri—that is, between Narrabri and Walgett—where it would be possible to make a weir. I say so because of the fineness of the soil and the readiness with which it would dissolve. The water running along the end of the weir would sweep it away in a short time.

1756. Suppose it was an overshot dam, the water would then go over the top? It would excavate so much below that eventually the dam would be probably carried away.

Dams and weirs.

1757. Would it not be possible to overcome that difficulty? I think the great difficulty in making dams or weirs on the Darling would be found in the exceeding fineness of the soil; it is an alluvial deposit of the finest character—if you take up soil in your fingers, it will dissolve away like soap if wetted. The Namoi in flood-time carries away such an enormous quantity of water that an obstruction of that kind might divert the course of the river. It has parallel rivers in places. The Darling, for instance, has billabongs running parallel to it for hundreds of miles.

Holding ground between Peel River and Carrol.

1758. *Mr. Franklin.*] Between the junction of the Peel and the town of Carrol is there any holding ground? Yes, I think so.

Nature of soil.

1759. What is the nature of the soil? It is chiefly basalt. Sometimes there is a sort of pebbly conglomerate with ridges running into the river. The flats about the Peel and the Namoi are alluvial.

Rapidity of stream.

1760. Is the stream very rapid? About and above Carrol it is; from Gunnedah it is slow. I never measured the rate.

Suitable place for a dam at Tulcamba.

1761. Do you know of any point in the neighbourhood mentioned where, by putting a dam across the river, any large quantity of water could be stored? Yes, I think there is such a place at Tulcamba.

1762. About what would be the height of the weir or dam required? I could not say the exact height; I should think about 30 feet or more above the water-level.

Area covered with water by the dam.

1763. *President.*] What area would that cover with water at the back? I could not say exactly; it would throw water back for several miles I should think.

1764. About how broad would be the area? It might be in one part half a mile or more broad? The place to which I refer is a spot at which two hills come close together.

1765. It is a kind of gorge? Yes.

Difference of elevation between Tamworth and Gunnedah.

1766. *Mr. Franklin.*] The Peel River is pretty rapid? Yes; there is a difference in the elevation of Tamworth and Gunnedah, which are about 50 miles apart, of 300 feet. The principal difference in the elevation is between the junction of the Peel and Tamworth. Of course the fall is the greatest where the river is the most rapid.

Storage of water on the Warrilla.

1767. *President.*] Are you acquainted with any other places in which the storage of water could be carried out in that district? I think it could be carried out on the Warrilla, a tributary of the Namoi.

1768. Much in the same way? Yes; there are a number of places on that river where water could be stored.

Distribution of the stored water.

1769. *Mr. Franklin.*] But supposing you stored a large quantity of water in that district, what would be the natural drainage—are there any obstructions to the cutting of tributaries or canals? The water stored there would have to be brought parallel to the course of the river for some distance.

1770. You are not aware that any levels have been taken there? I do not think so.

Wells on Breeza Plains.

1771. *President.*] You have marked a number of wells on the Breeza Plains? Yes; they are or were intended for improvements on selections.

1772. They are close to each other? Yes; the plain from Gunnedah to Breeza is about 22 miles.

1773. Do you suppose that these wells are tapped from separate underground channels or from one source?

Old stream of the Mooki.

I could not say; I think the course of the old stream of the Mooki might be traced back along the edge of the timber. The water was found under similar conditions—in sand, through which it has evidently percolated, because it was perfectly fresh.

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1774. Is it found in sand in all cases? Oh no—in some cases it is found in clay; in those cases it is invariably salt. If it is found in rock it is usually brackish.
1775. That would lead you to the conclusion that the water found in these wells does not come from the same source? I should say not.
1776. But wherever the water is found in sand, and is fresh, you are of opinion that it does come from the same source? I would not say that. I could not say that that is the case wherever the water is found fresh, because it is obtained at different levels and under different circumstances. In nearly all cases in the county of Pottinger it is fresh when it is found in sand, especially loose sand or gravel. Of course that points to the conclusion that the water percolates through the gravel. In the case of well No. 58 the water flows over the surface immediately at the foot of a basaltic hill, an isolated hill several hundred feet high. In the case of No. 57 the bottom of the well is 200 feet lower than the surface of the well at 58, and there is no water in it. It was sunk through red clay the whole distance.

Source of water in the wells.

1777. Has it ever been proved whether pumping or the raising of water from any one well in a large quantity affects the other wells in the neighbourhood? I do not think so; I have not heard of it, nor have I seen any proof of the kind.
1778. Do any wells fill quickly if they are reduced in quantity? In some cases; in other cases they fill slowly. There are two extraordinary wells at Moredevil Station, at the head of Bundella Creek. Many years ago a well was sunk to a considerable depth—I believe it was about 80 feet. No sign of water was obtained before this level was reached, when, as the workmen broke through some hard rock, the water rushed in so rapidly that they were compelled to abandon their tools and make good their escape by means of a rope and windlass. In a few hours the well was filled to within 10 feet of the surface. When this well exhibited symptoms of caving in another well was sunk about 80 yards easterly from the first. That was 100 feet deep, and was situated higher on the slope by 4 or 5 feet. When the bottom was reached the water came as rapidly as in the case of the first well, and rose to within 4 feet of the surface. On the following morning the first well had overflowed, and a strong stream, amounting to upwards of 300 gallons per hour was flowing from it. This has since continued through all kinds of seasons without cessation. The water is conveyed from that well in pipes for some miles. It is quite sufficient to water a whole station; it is close to the main range. Some information was given to me by the Manager of the station. He tells me that the first well is 6 feet by 6 feet, and is situated within 20 yards of the spring where, as a rule, water is on the ground. On one occasion they took out 5 feet of water, and the well rose 30 inches in 50 minutes. He tells me that after taking out 12 feet of water the water rose much more rapidly than it did at the higher level.

Two extraordinary wells at Moredevil Station.

1779. If the first well had been cased I suppose the water would have come to the surface in the first instance? I think in all cases where water rises rapidly it would come to the surface if it were prevented from escaping through loose strata.
1780. Have you had experience in any other part of the country? I have never had much experience, but I have been through the Colonies from South Australia to the Gulf of Carpentaria.
1781. That is many years ago? Yes, in Queensland; the others more recently.
1782. There nothing has been done in the way of sinking for water? Nothing at all. I saw some mud springs—there are several on the Barcoo in Queensland.

Mud springs on the Barcoo.

1783. *Mr. Donkin.*] They are principally in Queensland? Yes. There are none, as far as I can remember, from Springsure to Clermont, but there are some on the Barcoo.
1784. *President.*] What was the cause of you taking an interest in this question of wells? Mr. Russell invited me to do it. I took the matter up several years before this paper was written, and I did so because I was anxious to ascertain whether the information I could gather from a limited extent of country would lead to any conclusion as to where the water which fell on the surface went to. I knew that the Darling did not carry it away. I thought that information which I might be able to obtain could be applied to similar country in other parts of the Colony.

Object of the collected information on wells.

1785. After obtaining all this information, at what conclusion did you arrive as to what became of the water? I concluded that the water reached the sea through deposits of sand or gravel in various strata.

Conclusion from this information.

1786. Do you suppose that the water travels any distance underground through this country in this district where the wells are, that is to say, is the source of the water far distant from the wells? I should say 50 or 60 miles.
1787. Do you suppose that the water which falls on the higher country goes underground to any great distance into the interior of the Colony? I think so.

Underground currents into the interior.

1788. It goes to a great distance at a considerable depth? I should say that it continued until it reached the sea at a considerable depth.
1789. Never appearing on the surface? Unless in the shape of mud springs or in the shape of artesian water.
1790. That would be when it was struck? Yes.
1791. Did the result of your inquiries cause you to arrive at any other conclusion in reference to the escape of the rainfall? I think the principal part of the rainfall, the part which cannot otherwise be accounted for by every possible allowance for evaporation, waste, and soakage, can only be accounted for by assuming that it escapes through these underground strata.

Evaporation, waste, and soakage of the rainfall.

1792. You do not suppose that most of the water or any large proportion of it gets away in evaporation? A large proportion does.
1793. But not a larger proportion than has been asserted by Mr. Russell and others? I do not think so. I think that Mr. Russell's conclusion is more nearly correct than any other I have heard of.
1794. That would leave a large proportion to get away in the manner you suppose? Yes.
1795. You have not followed up these experiments elsewhere? I have not.
1796. Will you put in as an exhibit the pamphlet to which you have referred? Yes.
1797. Have you written any papers since? I have not.
1798. In the district in which you take so much interest, have they resorted to storing water in tanks to any great extent? Not to any great extent, because the wells are sufficiently numerous.
1799. They depend principally upon the wells? Yes.
1800. Have they adopted any means of raising the water by windmills? Oh yes; I think in the district of Gunnedah there must be fifty or sixty windmills at work now. When I collected this information there were none. The windmills have increased very rapidly since they were first tried.

Raising water by windmills.

1801. Do you know what windmills are most approved of? The Eclipse and the Althouse.
1802. Have they attempted to irrigate from these wells? No.

The Eclipse and Althouse windmills.

1803.

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1803. The water is simply used for stock purposes? Yes; and in some cases the windmills raise sufficient in the case of the head-stations to irrigate a small garden.

1804. Do you know whether the water pumped from the wells is distributed straight from the surface for the purpose of irrigating gardens, or whether it is allowed to be exposed to the air for a certain time? I do not think the water brought from the generality of wells would be serviceable for the purposes of irrigation.

Use of well-water for irrigation.

1805. You do not think so? No.

1806. Not if it were exposed to the atmosphere for any time? Perhaps if it were stored in tanks or dams it might be afterwards used, but I do not think it would be serviceable in many cases if it were taken direct from the surface of the well. I had a windmill of my own from which I watered a small garden. I allowed the water to spread over the surface, but it did no good; it left a white sedimentary deposit on the surface, and caused a growth of vegetation which I had never seen before—a growth quite foreign to the district.

1807. Did you ever know water from one of these wells to destroy vegetation? No.

1808. *Mr. Donkin.*] Why do you think that the water would not be serviceable for the purpose of irrigation? I think that in most cases it contains chemicals—salt, or soda.

Effect of ringbarking.

1809. Do you think that ringbarking has anything to do with increasing the water supply? There has been no ringbarking worth speaking of in the county of Pottinger, but I think it does increase the surface water.

Diversion of water from the Namoi.

1810. Are there any anabranches of the Namoi by means of which water could be diverted from the main river? There are some near Narrabri, but none near Gunnedah. The channel is marked.

1811. There are no instances of which you know where, by putting a weir across a river, the water could be diverted by any natural channel? No.

Waterhole near Turrawan.

1812. Not till you get below Narrabri? No. There is one point of the Namoi, near Turrawan, where there is a waterhole 6 or 7 miles long; I think it is 20 or 30 feet deep in places. It occurs immediately after a dyke of sandstone crosses the river.

1813. Do you know that remarkable mud-spring to which Mr. Russell refers, near Gilgoin? That is the spring which contains fossils.

1814. Do you know that? No; it has been described by my brother.

1815. *President.*] The only place you can think of for the conservation of water in the county of Pottinger would be that which you have indicated, and you would conserve the water by the construction of a weir in that case? That is the only way, I think; but it is in the county of Nandewar, not Pottinger.

1816. *Mr. Murray.*] Most of the land in the county of Pottinger is alienated, I believe? All that is of any value.

1817. Do you remember the drought of 1876—I believe your district suffered very much? Yes.

Suggestions to prevent effects of drought.

1818. Could you suggest to the Commission any practicable way of guarding against such an occurrence in the future, that is, speaking from your experience? You mean for preserving the stock in times of drought. I can only suggest that the paddocks in which stock are kept should be made much smaller, and that tanks or dams should be made in such positions that the stock would not have to travel far to obtain water. I believe as a rule they destroy far more grass than they consume in going backwards and forwards for water.

1819. Have you observed in your district the most likely places for obtaining water? It is uncertain.

Water on broken country and on plains.

1820. *Mr. Franklin.*] Do you find it easier to get water on the broken country than on the plains? Along the ridge, at the back of Bando, water can be obtained at a very moderate depth; on the Castlereagh side of the range the country is all scrub and sand. Water can be obtained on either slope.

1821. Then it is easier to get the water in the broken country? I think so. The sinking on the plains is very uncertain. For instance, in a well at Colly Blue about 60 or 70 feet deep the water was so deficient in quality that stock would scarcely taste it. In the case of another well sunk about 15 feet distant, at about one-half of the depth they got an unlimited supply of good fresh water.

1822. *President.*] If the soil is over sand, water can generally be obtained? Yes.

Conservation of water from the Mooki.

1823. *Mr. Murray.*] Is it possible to conserve water from the Mooki? It would be at the head of the Mooki or of Cox's Creek, but not about Breeza.

1824. *Mr. Franklin.*] Do you know of any point for water storage on the Namoi, below the junction of the Manilla? Oh yes. There are many places on the Namoi where in any ordinary drought the river ceases to run; the higher up the river you go the more strongly the water runs.

The Namoi dry between Narrabri and Walgett

1825. *President.*] Does the river appear again further down from the point at which it is lost? Yes, between Narrabri and Walgett it becomes dry, and afterwards you meet it lower down running strongly. I have frequently seen the Namoi dry in many places.

Sandstone at Turrawan.

1826. *Mr. Franklin.*] Are there ridges of impermeable country between these soakages on either bank? I do not think so. There is a place at Turrawan where a dyke of sandstone crosses the river.

1827. Does it appear on both banks? Yes.

1828. How far from the junction of the Manilla? About 70 miles.

Watershed of Cox's Creek and of Brigalow Creek.

1829. Does that sandstone dyke run laterally from the river? It is the ridge dividing the water-shed of Cox's Creek from the watershed of Brigalow Creek.

1830. Is there any settlement on the western side of the range? The country is of no use—it is simply a home for marsupials—you could not ride through it. There is a station there of 100 square miles, but no one uses it.

Eastern slope impermeable; the opposite slope sand.

1831. But water raised on the eastern slope would be valuable? Yes. The country on the eastern slope of the range is impermeable; on the opposite slope it is all sand.

1832. *Mr. Donkin.*] It is your opinion that if any of these western rivers were to be dammed a scour would take place? Yes. The further down the river you go, the greater would be the difficulty in damming it.

1833. *President.*] In the case of the bar on the Namoi of which you spoke I suppose the water flows over it? Yes.

1834. It does not disappear and reappear again? No. Immediately after that dyke there is a waterhol about 7 or 8 miles long, commencing at the bar.

1835. *Mr. Franklin.*] That is permanent water? Yes.

Disappearance of water.

1836. *President.*] From your knowledge of the river, should you say that the water which disappears at any point appears again in the same volume? Yes, it appears to flow again in an equal quantity.

THURSDAY,

THURSDAY, 16 *OCTOBER*, 1884.

Present:—

MR. BARTON, M.P., | MR. GIPPS, C.E.,
MR. DONKIN, J.P., | MR. LYNE, M.P.,
MR. FRANKLIN, C.E., | MR. MURRAY, M.P.,
MR. M'MORDIE, B.E.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. Philip Francis Adams called in and examined:—

Mr. P. F. Adams. 16 Oct., 1884.

1837. *President.*] You are the Surveyor-General? Yes.
1838. How long have you been in the Public Service? Twenty-seven years.
1839. How long have you been Surveyor-General? Since the year 1868.
1840. I presume that you are well acquainted with the interior of the Colony? I have travelled nearly all over the Colony.
1841. Then you have practical knowledge and experience of the inland portions of the Colony? Yes.
1842. Have you ever had carried out surveys of the rivers or any portions of them? The Survey Department has carried out a great many surveys on rivers, but they have not been made with a view to the objects of this Commission. Our surveys show features in plan, without reference to section, falls or levels. Surveys of rivers.
1843. Then these surveys will be of little practical use to us? They will be good plans for many purposes of the Commission, but there are no sections to accompany them.
1844. In a letter which you sent to the Commission you intimated that you could give us a considerable amount of information with reference to the snow-waters of the Colony? I have had experience on both sides of the Snowy Mountains. It is many years since I was on the west side, and I have not preserved the barometer heights which I took at that time. My impression is that if any permanent system of irrigation is adopted in this Colony it must be drawn from snow-waters. The thawing of the snow occurs from October until the end of January, during which time there is an almost unlimited supply of water in one or two rivers, at an altitude sufficient to command some of the most important parts of the Colony. Snow-waters.
1845. What rivers are those? On the east the Snowy River. It is estimated that during the driest part of this year the volume of the Snowy River was 200,000,000 gallons a day. Volume of the Snowy River.
1846. *Mr. Gipps.*] Where was that? The point where the section was taken is about 5 miles above the junction of the main Snowy and Eucumbene Rivers.
1847. At what time of the year was that section taken? It was about June or July last, when everything above was frozen and thaw-water at its minimum.
1848. *President.*] Does the Snowy River discharge into the Murray or the Murrumbidgee? No, it runs into the sea through the Gippsland country in Victoria. The object of my bringing these suggestions under the notice of the Commission is that the water may be used to supplement that of the Murrumbidgee, if for nothing else. The Murrumbidgee has been almost dry when this river was pouring out an unlimited supply. Diversion of water from Snowy River into the Murrumbidgee.
1849. What portion of the Snowy River is within our boundary? The greater portion of it. I think that the longest half is in New South Wales, but I do not think that the fact of its going through Victoria would affect the practicability of the scheme at all, because, during the time that we should be taking out water, the Snowy River is an enormous torrent. It is one of the largest rivers in the Colony—probably it discharges more water than any other river in the Colony.
1850. Are there any barriers between that river and the upper part of the Murrumbidgee which have to be surmounted in diverting the water? A continuous fall could be obtained, but whether the physical difficulties in the course are too great to be overcome I cannot say, because I have not made investigations; I only give you the fact that there is an enormous supply of water, equal to anything which would be required for irrigation purposes, and that such water is available at an altitude sufficiently high to command the dividing range between the waters of the Snowy River and the Murrumbidgee. Having got the water on to that dividing range, it is possible that it may be conducted where it may be desired. Of course the physical difficulties may be too great, but I think there is a possibility of such a scheme being carried out. Barriers between Snowy and Murrumbidgee Rivers.
1851. You said that you had been there? Yes, I have been on both slopes of the Snowy Range, of which Kosciusko forms the summit.
1852. To carry this water in the direction you suggest, would there be any length of tunnel required to get through the range at the head of Stack's Creek? Not that I am aware of. It might not be necessary to make a tunnel or it might, but it is a physical fact that the range at the head of Stack's Creek is lower than the source of supply of water on the Snowy River. Is a tunnel necessary?
1853. *Mr. Gipps.*] What is the height of the point at which you propose to divert the water? 3,200 feet approximately. That is the result of one aneroid observation only. Height of point of diversion.
1854. *President.*] Is there any very great dip in the country between Crackenback Creek and Stack's Creek? Yes, in the valley at the junction of the Eucambene and the Snowy Rivers the height is barely 3,000 feet; that is about 200 lower than the gap at Stack's Creek. Dip of country.
1855. What is the height of Stack's Creek at the gap? It is about 3,200 feet.
1856. That is about 200 feet higher than at the junction which you mention? Yes.
1857. Is the range at the head of Stack's Creek a broad one? I could not say positively; it is my impression that it is, but I have not been over it. I have had the barometer heights taken since I thought of the scheme, but I am not aware what conditions present themselves—that will be a matter for investigation by some one else.
1858. Is the country between Crackenback Creek and Stack's Creek very much broken? Very much. If the scheme which I suggest is practicable at all a large amount of work will have to be done. Broken country between Crackenback and Stack's Creek.
1859. Why is it that in the map which you had before you you have marked such a long elbow down the Eucumbene River as showing the creek's diversion which you suggest? There is high ground to the north of the junction of Eucumbene and Snowy Rivers, and therefore I have marked the diversion approximately where I think it would be likely to go.
1860. Have you any idea of the height at the junction of the Mowomba River? I have not; I have not been there. Height of Mowomba River.

Mr. P. F. Adams. 16 Oct., 1884.

1861. Suppose the elevation of Stack's Creek to be too high to carry the water over the top, can you give any idea as to the length of tunnel which would be necessary to convey the water through the range? Not the least. I think that the cost of a tunnel would be fatal to the scheme—it would be too long. I do not think that there is any danger of not getting height enough to command the gap, because above the point at which the elevation was taken the creek rises rapidly and the amount of water is not sensibly diminished. It is only a question of going higher up the Snowy River to attain the necessary elevation to command the head of Stack's Creek.

Diversion from tributaries of Snowy River.

1862. Do you think it would be possible to connect any of the tributaries of the Snowy River higher up and make the diversion at a higher level than you have suggested? Certainly. The Crackenback has about the same fall as the Snowy River, and by going higher up almost as much water can be obtained as the section indicates, perhaps 40 or 50 million gallons a day.

1863. Can you divert the Snowy River, the Crackenback Creek, or any of the creeks into the Eucumbene higher up to get their water? I do not think so. The reason why I do not think the Eucumbene water would be of much value is because that river falls at a time when the Snowy and the Crackenback are at their highest.

1864. What I mean is, could these creeks be diverted to the Eucumbene higher up? It might be possible but I do not think desirable, because there is plenty of water without going there for it.

1865. But would not the elevation be better? I think not. In my opinion a larger and more reliable supply would be obtained from the Snowy River, and at a higher point than on the Eucumbene. I judge from the amount of snow and superior altitude, but I may be mistaken, as I have not followed the Eucumbene, or looked at it with a view to water supply.

Depressions between Crackenback and Stack's Creeks.

1866. According to your showing, at certain points between Crackenback Creek and Stack's Creek there are depressions? Yes; they will have to be crossed.

1867. Would it not be better, if possible, to divert the Crackenback and Snowy into the Eucumbene at a point where you would get a higher elevation, and thus instead of going round in the way you suggest, crossing Stack's Creek further up? I have not considered that, and I should not like to offer an opinion on the subject. When I travelled through the country it never occurred to me to consider the question which is now before the Commission, and the impressions I have to guide me are those which I gathered on the occasion of my visit—elevations which I took. I do not think it would be advisable for me to offer a definite opinion on the subject, because greater weight might be attached to it than it deserved; besides I have not seen the locality.

Point of diversion on the Snowy River.

1868. *Mr. Murray.*] At about what point on the Snowy River do you suggest that it should be diverted? About 4 miles above the junction of the Crackenback and the Snowy, and about 5 miles from the junction of the Eucumbene and the Snowy. On the 15th February last I saw a stream there infinitely larger than that which I have described—it was so large that the supply was practically unlimited. The water drains the north and east slope of Kosciusko.

Necessary examination of the country.

1869. *President.*] Would you suggest an examination of the country with a view to determine whether it is quite practicable to divert the water as you suggest? Certainly. I think a portion of the Commission should visit the locality, and that a report ought to be obtained from a practical engineer on the subject.

1870. *Mr. Barton.*] Do you not think it would be a wise precaution to take to see the streams at the present time in a season like this, when there is hardly any snow falling? It is not necessary to examine the streams for that purpose, because you may take my word for it that there is more water there than you will ever want. The river is almost unapproachable on account of the quantity of snow thawing. If the Commission visit the river I should advise an inspection in January, not later than the middle of the month. The later you can safely put off the visit, the more important would be the information which you would be able to gather.

Effect of diversion on the Snowy River.

1871. *President.*] Suppose the work were carried out, what effect do you think it would have on the Snowy River? It would not be felt.

1872. That being the case, no great objection could be raised by the Victorian Government? I do not think it possible for them to raise any valid objection. The quantity of water which could be taken by human means would not affect the volume of the Snowy River in Victoria one inch.

1873. Does the Snowy River discharge itself into the Gippsland Lakes above the point of settlement in Victoria? I cannot answer the question—I have never been on the Gippsland Lakes.

The Murray supplied by the Snowy River.

1874. Do you know whether the Murray receives any large portion of the Snowy water from Kosciusko Range? Yes; on the west side of Kosciusko Range the principal affluents of the Murray are the Indi and the Tooma.

1875. Is that the reason that there is a so much larger quantity of water flowing in the Murray during the spring and summer than there is in the Murrumbidgee? This is one reason, but the Murray drains a large area of elevated country in the Colony of Victoria as well as in New South Wales.

Effect of the diversion on the Murrumbidgee.

1876. If the suggestion which you have thrown out to divert a portion of the Snowy River into the Murrumbidgee were successfully carried out, I suppose that the volume of water in the Murrumbidgee would somewhat approach that in the Murray? No; the increment would be limited. I could only suppose that 200,000,000 gallons a day can be supplied. It might be supplied by about 40,000,000 gallons a day from Crackenback, but all the water that could be collected at a higher level than the head of Stack's Creek would not augment the volume of the Murrumbidgee to anything approaching that of the Murray—that would be impossible. The advantage of taking the water from the Snowy River would be to command the dividing range between the Murrumbidgee and the Lachlan Rivers.

Supply of water on the dividing ridge between the Lachlan and the Murrumbidgee.

1877. Do you mean to divert a portion of the Murrumbidgee water on the ridge? The Murrumbidgee does not produce water enough in snow-time to effect a very great improvement. A body of water like that in the Snowy River, laid on to the dividing range between the Lachlan and the Murrumbidgee, would have a wonderful effect on the country there; irrigation would be possible as far as the supply of water would admit.

1878. Put irrigation to some extent on one side—Do you consider that the advantage to be derived from diverting the stream for the supply of stations and farms would be very great? Certainly it would, but whether it would warrant the cost I cannot say.

Area of Snowy River to be diverted.

1879. Can you give the Commission any idea of the area of the Snowy River which could be diverted? About 165,000 acres altogether; 125,000 from the Snowy, and 45,000 from the Crackenback.

Levels useful to the Commission

1880. Can you give us the different heights in other parts of the Colony? We have a great many uncomputed heights in the triangulation, and a great many aneroid results, which can be put at the disposal of

of the Commission. I think though that the railway levels would, however, be more useful to the Commission. Mr. P. F. Adams. 16 Oct., 1884.

1881. But would not the levels which we can get from your Department give us information on a variety of points which we cannot get from the levels taken by the Railway Department? Yes.

1882. Have you any useful levels of the country between the ranges and the Darling? No; the trigonometrical survey has not gone over the range in any part. I think that the altitudes of all the meteorological stations are accurately determined by the Astronomer; they are accurate enough for your purposes. Altitude determined by the Astronomer.

1883. How were they taken? They are the result of a number of barometer readings.

1884. I suppose that you have seen the heads of most of the rivers? A great many of them.

1885. From your observations, do you think that any large quantity of water can be stored in natural basins by damming the rivers or by diverting them? No, I have no faith in that as a source of water supply. Storage in natural basins.

1886. Do you know whether towards New England there are any snow-capped ranges similar to those in the Snowy Mountains? No, the altitude is not sufficiently high for snow to remain long in the latitude of New England. Snow in New England.

1887. What further information can you give us with reference to the western side of the Kosciusko range? It appears to me that it is nearly possible to bring a supply of water from the Tooma on to the range between the Murrumbidgee and the Murray. Supply from the Tooma on to the range between the Murray and the Murrumbidgee.

1888. But in doing that, you would be simply robbing one river to divert the water to another? The object would be to distribute the water at a high level. To a certain extent the water which comes down the Murray goes to waste. 1,000,000 gallons distributed on top of the range would be more valuable in producing than 20,000,000 gallons going down the river.

1889. Do you know any name at that point by which we can distinguish it? It is above the junction of the Pound Creek with the Tooma River, below the mountain called Black Jack, or as it is named on the map, Manjar. Although I have no heights to prove it, I am quite as certain of the probability of it as I am of the possibility of diverting the water of the Snowy as I have suggested. It is weighted with the same physical objections as the other scheme, and through physical difficulties neither may be thoroughly practicable, still they are possible, but whether they are practicable or not I shall not say. Point of diversion above junction of Pound Creek with Tooma River.

1890. Is it your idea to throw the water across the ridge on to the Murrumbidgee Falls or the Murray Falls? I would keep upon the Murray Falls until a point on top of the Dividing Range is attained. The water to be kept upon the Murray Falls.

1891. When you reach that point, which way would you propose to throw the water? I could not say. It is immaterial. Once the water is on top of the range it is at command, and may be diverted in any direction which would be desirable or which would present the least physical difficulties.

1892. Do you know that part of the country well? Tolerably well, but I have not been there for about twenty years.

1893. Is the valley above the point you speak of, where the water can be diverted, what is known as Toolong Plains? I do not know what is the exact position of Toolong Plains. The object of my evidence is to point out the only localities which I know of that bear any comparison with the water-producing localities of India and California.

1894. Do you think that it would be possible to lay down pipes of sufficient size to divert such a quantity of water as would be of any value for distribution in the lower country? I could only refer to what has been done in other countries. Pipes for diversion of water.

1895. Have you any reports with reference to inverted siphons? No; I think that Mr. Darley is possessed of some valuable information on this subject. Inverted siphons.

1896. Have you any levels connected with the rivers of the Colony? I cannot indicate any, for when levels are taken in my Department it is generally for some purpose beyond it, and copies are not kept.

1897. *Mr. Gipps.*] For what purpose do you suggest that the Snowy River should be diverted into the Murrumbidgee? To supplement the Murrumbidgee supply, or to keep a constant supply in Lake George, or to irrigate the country between the Lachlan and the Murrumbidgee. Purpose of diversion from the Snowy into Murrumbidgee River.

1898. You consider it feasible to make a large and impounding reservoir of Lake George? I think so, but I should not like to say so positively because I have an idea there would be difficulty in getting the water out of it, but I have not investigated the matter. Lake George.

1899. Can you give us any information with respect to contour surveys of New Zealand? No, I have not seen any of their contour surveys Contour surveys.

1900. Do you think it would be feasible for surveyors here to take contour levels? Certainly. Contour levels.

1901. Do you think it advisable? The cost would be very great; in fact a contour survey would have to be made independently of the ordinary measurements for alienation—it would be far more economical to do so. In the course of the contour survey the position of alienated and mapped measurements could be picked up and connected with the contoured features already surveyed.

1902. Would not a contour survey give a better idea of the general features of the country? It would be very valuable, but it would be very costly.

1903. Do you know anything about the question of diverting a portion of the Murrumbidgee into the Yanko? I have been there, but I am not in a position to say more than that I think a dam in the Murrumbidgee a few feet high would turn a stream of water down the Yanko. Diversion from Murrumbidgee into Yanko.

1904. Do you think that the stream would be so great that it would practically affect the Murrumbidgee lower down? I do not.

1905. Have you had any levels taken in that part of the country which would be useful to the Commission? No. I know that the general inclination of the country there is westerly, and that it is from 8 inches to a foot in the mile. Incline of country.

1906. Do you think that the work which you have suggested ought to be carried out by the Government, or that Water Trusts should be appointed? It may not be possible to carry out such a work in our time. It is an enormous scheme I have not formed an opinion as to how it should be worked. How the suggested works should be carried out?

1907. But do you not think that it should be made a national work? I have never considered the question, but probably it should.

The

The Honorable William Adams Brodribb, M.L.C., called in and examined:—

The Hon. W. A. Brodribb, M.L.C.

16 Oct., 1884.

1908. *President.*] You have had considerable experience in the interior of the Colony I believe? Yes. I have put my views in writing, and with the permission of the Commission I will read my statement. I have been occupied in pastoral pursuits in various parts of this Colony since 1835, viz., Maneroo, Gundagai, and Goulburn, up to 1854. I then took up new country on the Billabong Creek, about 30 miles north of Deniliquin, where I formed the Wanganella Station, it being almost waterless when I purchased it, in a state of nature, from Mr. Alexander Innes. I first saw it in 1854, and then chained down the almost dry creek from the Conargo Waterhole to the Wanganella Waterhole, a distance of 20 miles, and then on to the Croonboon Waterhole, 12 miles further down. I was enabled to mark off my new purchase from what was called the Ten-mile Waterhole, down the creek, a distance of 12 miles. The run ran back 5 miles on each side of the creek, comprising an area of 120 square miles. On the 1st January, 1855, I formed an expedition overland, crossing the Australian Alps in the middle of summer with my stock. It took me three months to reach Wanganella. The country was very dry, as there had been no rain for nearly twelve months, and bush fires had extended for miles; nearly the whole of the run had been burnt, and there was little or no water in the creek, and the prospect for the future was most gloomy and depressing. After various troubles and losses, I had to turn my whole attention to the securing of water—first, by dams on this intermittent creek, which passed through very level country for nearly 200 miles to the Edward River. A few yards below the Wanganella Waterhole I commenced to construct an over-shot dam, by placing two rows of piles across the creek, in the shape of the creek. The upper row I lined with sheets of zinc, filled in with clay between the two rows of piles, and then covered the same with zinc; I made a kind of apron, of wood, below the lower row of piles, for the water to fall on, and above the upper row of piles I carted in a large quantity of clay, sloping up to the top of the dam. No water came down the creek for upwards of ten months after I had completed this dam, and we had only about 18 inches of water in the hole above the dam. I had to sell all my stock off except my horses; a neighbour of mine on the Edward River wrote and offered me a vacant place he had on the river and a paddock in which I could put my horses, and I was about to avail myself of his kind offer when I heard the creek had commenced to run some distance up near the ranges. However, it came down very slowly, as the creek was very dry and tortuous. At last it reached my dam; I watched it carefully until 2 o'clock in the morning, and saw the water flow in. To my great delight it showed no sign of leakage in the dam; it became quite a flood, and covered the whole dam. The structure was quite out of sight for nearly six weeks, and the surplus water flowed into the Edward River. When the water began to subside I placed sand-bags across the dam, and thus the water rose 2 feet higher, making the depth of water at the dam about 6 feet, and about 18 feet in the natural hole, and the water backed up the creek about 5 miles. I kept a gauge in the dam, and I looked at it every Sunday. I found that on an average the evaporation was about an inch a week. The stock used to go to the dam for water, and sometimes my neighbour's stock were watered at it. I subsequently made another dam of the same kind, about 8 miles higher up the creek, and thus secured a supply of water for a considerable time, as I thought. I re-stocked my station. Many squatters up the creek followed my example, and some came long distances to see my dams. Another dry season came on, and those who had not constructed dams to secure water suffered considerably. In some of the wells I sank the water was brackish, still, after a time, the sheep drank the water, and did very well on it. About the early part of 1858 a party of men went up the creek in the middle of the night and destroyed the Coree Dam, the property of Messrs. F. and G. Desailly, who repaired it, and for weeks kept armed men to prevent it being destroyed again. However, a party of twelve men went up the creek and destroyed about twenty-three dams, under the impression that their runs would be supplied with water. This destruction of property was perpetrated by men who had neglected to secure water by construction of dams when the creek flowed through to the Edward River for weeks, but they were doomed to disappointment, for, having cut the dams, they found the water did not run more than two or three miles below each dam. They came to my house on the 17th November, 1858, and told me they had burnt my upper dam by fire, there being no water in the dam at the time. They went to my house dam and cut away two panels, but there was very little water in the dam at the time. I prosecuted them before the Deniliquin Court of Petty Sessions, and three of them were committed to take their trial at the Goulburn Quarter Sessions to be holden on the 10th January, 1859. I had to go by Melbourne, thence by water to Sydney, and on by mail-coach to Goulburn, and, after all, the men were acquitted, and afterwards brought an action for damages against the Magistrates for committing them, and I had to attend at the Supreme Court in Sydney at a great deal of inconvenience. The case went on for sixteen days, when the men withdrew it, and they had to pay all costs. I repaired the dam after it was cut. This dam had been constructed twenty-eight years back, and has never been empty since, and has supplied the Wanganella township with water, besides having supplied the stations on each side with water. The destruction of dams occupied the attention of every one in the neighbourhood, so much so that the Government, through the Commissioner of Crown Lands, ordered the Commissioner of the district, Mr. Chas. G. N. Lockhart, to report upon the desirability of constructing dams along the Billabong Creek, and of suggesting some scheme which would be acceptable to all parties on the creek. The settlers along the Billabong Creek, seeing there was no protection to those who constructed dams, held a meeting, and they appointed a Committee to examine the upper part of the Yanko Creek, where a channel came from the Murrumbidgee River, opposite Narandera. A Company was formed to make a cutting in the Yanko Creek at such a depth as to allow the water in ordinary floods to flow down, first into the Colombo Creek, and then into the Billabong, and each settler was to contribute so much, according to the frontage on the creek. This undertaking cost between £10,000 and £12,000. I contributed £800 towards the work, and never received any benefit from it unless in very extreme floods, as the water below the Yanko Station, on the Yanko Creek, was absorbed in the bed of the creek. At Bundure a horse would even have to swim over when the creek was running a strong stream, but a mile or so lower down it would take a week or ten days to run two or three miles. About a foot under the bed of the creek was loose sand, which absorbed nearly all the water. I was once located on this creek, and in making a yard I tried to dig a post-hole in the bed of the creek; I came upon sand and water. This at once accounted for supply of water in the wells sunk out on the plains 100 miles in a western direction lower down. I subsequently formed stations north of Booligal about 30 miles, and when inspecting the country in 1863 we had to cart water from the Lachlan River for ourselves and horses, the whole country being quite waterless. We had to sink wells and make dams in some dry watercourses.

Effect of the drought in 1855.

Over-shot dam below the Wanganella Waterhole.

Evaporation 1 inch a week.

Quality of water.

Twenty-three dams destroyed by men.

The Wanganella dam never empty for twenty-eight years.

Yanko Creek.

Water absorbed in the bed of Yanko Creek.

Drought in 1863.

courses. These watercourses were supplied occasionally by local rains. The wells we sank varied from 120 to 140 feet deep, and the water generally rose from 20 to 40 feet in each well, but the water was slightly brackish, and the stock got to like it after a while. Near our head station was a dry cane-swamp. In a wet season I have seen the water running into this swamp for days, and disappearing down wide cracks in the swamp. At last the earth would fall in and these cracks become choked up, and then the water would remain on the surface. I remember on one occasion, in 1867, I was travelling with the Commissioner, Mr. Futter, when he was appraising runs. We were camped under the Wanarary mountains, some 50 miles north of our station, when it came on to rain in the night, and at daylight a volume of water came down in torrents through a gorge between the mountains. The creek was so rapid that a horse could not cross it with safety where we were camped. After breakfast I had the curiosity to walk down the creek, about half a mile into the level country, and to my astonishment all this water running for forty-eight hours went into the ground covering not more than 50 yards square. This at once accounted to me for where the water came from which supplied the wells on the level plains. I was then located about 5 miles south of the Willandra Creek. The occupants of this creek came to the determination of adopting the same plan that was resorted to some years previously in the Yanko Creek, near Narandera, and make a cutting, so as to allow the water from the Lachlan to flow down it. I have been told not one drop of water had flowed down this dry watercourse for upwards of twelve years. Mr. R. Kennedy, of Roto, Messrs. Whittingham Bros., and Messrs. F. C. and K. E. Brodribb, and the Messrs. Desailly completed this cutting at a cost of over £10,000, and they subsequently constructed dams for miles down this at 8 or 10 miles apart. In 1864 there was not a sheep on this creek—now there are upwards of 5,000,000. There are wells sunk out on the plains on each side of the creek. During heavy floods this creek flows through and fills all the dams. Each dam has a by-wash, to allow the water to flow back into the creek. In ordinary floods the water does not flow all down the creek. The settlers lower down threatened to go up in a body and cut the dams, and in some instances it was done, and this is the reason why I have been for the last twenty-five years trying to get a law passed to legalize the construction of dams on equitable and fair principles. I remember on one occasion being out some 30 miles north of the Mossgiel station, at a place called Ganoble. In front of the house there is a large dry lake, quite 6 miles across, and in crossing this dry swamp I have often wondered how and when it became filled. When filled it would hold a large body of water, covering quite 20 square miles of country, or 15,000 acres. On the last occasion I had to visit this part of the country it was just after a heavy flood in the Lachlan River, and the Willandra Creek ran all through, nearly if not quite 200 miles. To my surprise, I found the water running into the dry swamp at Ganoble. The shepherd told me the water had broken out of the ground on the eastern side of the lake, where there was no watercourse from the Willandra Creek, and ultimately the dry lake became full, and had the water continued running down the Willandra Creek it would have filled another dry swamp north of the Ganoble Swamp, as there was a dry channel between the two. I am quite convinced, from what I have seen during a long experience, that we are only on the threshold of discovering the best mode of supplying the dry pastoral country with water by wells and dams. I firmly believe this is far more important even than the Land Bill, for without water more than two-thirds of the Western Division is useless. As a rule, well-water is useless for irrigation. Our Land Laws since 1861 have rather tended to discourage enterprise. By judicious legislation, agricultural and pastoral pursuits might work in harmony with each other, but the present laws make them antagonistic, and unless properly administered the new law will be no better than the old one.

The Hon. W. A. Brodribb, M.L.C.

16 Oct., 1884.

Water coming down from Wanarary Mountain.

The Willandra supplied from the Lachlan.

Law to legalize the construction of dams.

Dry lake at Ganoble.

Water broken out of the ground.

Well-water useless for irrigation.

THURSDAY, 30 *OCTOBER*, 1884.

Present:—

MR. BARTON, M.P.,
MR. DONKIN, J.P.,
MR. FRANKLIN, C.E.,
MR. GIPPS, C.E.,
MR. LYNE, M.P.,
MR. MURRAY, M.P.,
MR. M'MORDIE, B.E.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. W. B. Henderson called in and examined:—

Mr. W. B. Henderson.

30 Oct., 1884.

1909. *President.*] What is your official designation? Superintendent of diamond drills.
1910. How long have you been in the Colony? Since September, 1872.
1911. How long have you occupied your present position? Since April, 1882.
1912. What was your occupation before that? I was connected with mining generally.
1913. In what parts of the Colony? I have had charge of mines all over the Colony; in fact I was engaged by a Sydney firm to travel over the Colony and inspect mines on their behalf.
1914. In what parts of the Colony have you worked the diamond drill? Chiefly in the eastern coast district and the central parts of the Colony.
1915. Have you had anything to do with the drills working west of the Darling? Yes, with auger drills.
1916. Can you give us any information respecting bores put down on the western side of the Darling? I have sections of the bores put down between Bourke and Wanaaring. Here is a section of a bore put down 51 miles west of Bourke. (*Appendix* L 1.)

Sections of bores between Bourke and Wanaaring.

1917. Fresh water was struck in the bore at a depth of 30 feet? Yes.
1918. To what height did it rise in the bore? The lower we struck water in the bore the higher it rose. At 61 feet we struck fresh water again, and it rose to within 3 feet of the surface. At 70 feet we struck fresh water again, and it rose to the same level. At 89 feet 2 inches we struck fresh water, which rose 8 feet above the surface, giving 1,000 gallons per day.

Rise of water in the bore.

1919. Were there any indications of water on the surface before you put the bore down? The Goonery Springs are not far distant.

Goonery Springs.

1920. What kind of springs are they? Mud springs; but they were not giving out much water when we started the bore.
1921. What is the distance between the springs and the bore? It might be a quarter of a mile; there are several springs.

Mr. W. B. Henderson. 30 Oct., 1884.

1922. Have you had the water from the bore and from the springs analyzed and compared? No; but I have had the water from the bore analyzed.

Rise of water in tubed bores.

1923. *Mr. Barton.*] Have you ever found, when you have struck water and it has risen to a certain height, that by putting tubes in the bore the water has risen higher? The bore to which I am referring had to be tubed. The most important consideration in connection with our work when water is struck is to ascertain the quantity and quality of it; sometimes boring is discontinued for days for this purpose. After the water has risen to apparently its highest level, we pump it out to see if it will rise to the same level again in equal quantity, and, periodically (every six months, as near as possible), the supply coming to the surface is tested. When we have tested the supply of water at any depth, and it is decided to continue the bore, the water is shut off, so that the supplies from different depths are not mixed. You will see from sections which I have brought with me that we get fresh and salt water near together, but we prevent them from becoming mixed. The ground would not stand unless the bores were firmly tubed. We are using Wright and Edwards' Australian water auger, to work which the bore must be dry.

Test of the supply.

Preventing salt water from mixing with fresh water.

Fresh water in cretaceous formation.

1924. *President.*] The first three supplies of fresh water in the bore to which you have referred were struck in sandy drift, and the last supply in blue clay and flinty sandstone? It is all cretaceous formation.

Bore 7 miles west of Goonery Springs.

I have brought with me specimen cores from a bore which we had put down about 7 miles west of the Goonery Springs. This one is down 470 feet, and there is an artesian supply of water. (*Appendix* L 2.)

The formation dips to the west.

1925. These two bores show that the cretaceous formation dips to the west? Yes, very fast. The water is obtained in the two bores in the same kind of strata. The formation is the same, only that in the western bore is covered by another formation which does not exist in the locality of the Goonery Springs bore. There is a large supply of salt water over the fresh water. The water flowed over the surface from both bores, the depth of one being 89 feet 2 inches, and the other 474 feet.

Lap-welded artesian tubes.

1926. What kind of tubing do you use? Lap-welded artesian tubes, with specially made joints.

1927. Will that kind of tubing last? Yes, it is the best quality of tubing.

Size of bores.

1928. What is the size of the bores which you put down? We start at 8 inches, and then we put in 7-inch tubes, and so on as occasions require. The tubing is done on the telescopic principle. We put down a 7-inch tube as far as it is possible to force it, and then the size of the bore is reduced. This system is absolutely necessary when passing through country which is composed of swelling clay. It is possible on this principle to bore to a depth of 3,000 feet, the size of the tubing varying from 7 inches to $2\frac{3}{4}$ inches. As a rule three or four changes in the size of the tubing are sufficient.

Map showing position of bores.

1929. *Mr. Murray.*] Have you a map showing the positions of bores and wells throughout the country? Yes, I produce a map (*Appendix* L 3), accompanying which there is a tabulated statement giving all the information which I have been able to gather respecting bores and wells.

Artesian water west of Bourke.

1930. *President.*] In the bore at the 57-mile post, west of Bourke, at what depth did you strike artesian water? It was artesian from 349 feet, at which depth brackish water was struck.

Dip of the cretaceous formation.

1931. You say that the difference in the depth at which the cretaceous formation was struck in the bores shows that the formation dips very much to the west? Yes, I should think that between the two bores it dips at least 400 feet, or about 60 feet per mile.

1932. If that theory be correct, there must be an immense cretaceous basin to the north and west? My idea is that the fast dip indicates that the bed cannot extend over a very large area; if the dip was less it would indicate that the bed extended over a larger area.

Cause of presence of salt water.

1933. How do you account for the presence of salt water there? It arises from the saline properties of the deposits which were made when the land was under the sea. There have been deposits at different times, and in some of the beds, which are almost horizontal, we get salt water and in others fresh water.

Supply from the 57-mile post bore.

1934. Can you state the supply of water from the bore at the 57-mile post? It has been tested from week to week, and the supply appears to be getting larger. The present supply is 4,320 gallons per day. I produce specimens of the core from this bore. The fossil shell embedded in the rock came from a depth of 461 feet. The water coming from the bore is quite fresh. I wish to direct particular attention to the fact that this bore, the bottom of which is through hard rock, was put down by Wright & Edwards' steel borer.

Size of tube at surface.

1935. What is the size of the tube at the surface? 6 inches.

Size at lowest depth.

1936. And at the lowest depth? 4 inches. When the ground becomes as hard as it is in the bottom of the bore nothing but a diamond drill will work through it to advantage.

Duration of work.

1937. How long have you been working at that bore? The work was started on January 28th last, but only one-third of the time has been occupied in boring, owing to the very dry season.

Number of men employed.

1938. What number of men have you had working there? Three, generally engaged boring, together with teamster and cook.

Weight of boring apparatus.

1939. *Mr. Gipps.*] What is the weight of the boring apparatus? 3 tons 10 cwt. complete.

1940. Does that include all the necessary tools? Yes, the top portion of the apparatus is very light; the principal weight is in the rods.

Cost of the bore.

1941. *President.*] Can you give us an idea of the cost of the bore at the 57-mile post? Yes, I can furnish it (*Appendix* L 4); but I wish to explain that before we struck water there we had to cart water from Goonery, and had occasionally to use manual instead of horse-power to work the borer.

Depth of alluvium.

1942. *Mr. Gipps.*] What was the depth of the alluvium? About 30 feet, I think.

1943. Did you get any water in that? Salt water.

Cost of work reduced to a minimum.

1944. *Mr. Franklin.*] I suppose that you carry on your operations in such a way as to reduce the cost to a minimum? Yes; I am prepared to show that we are boring at less than half the cost of similar work in other Colonies.

Work retarded through the tests.

1945. Do not you think that the work is retarded very much by the tests which you make as to the quality and quantity of the water? Yes; but I regard it as being of far more importance to ascertain what is the extent and quality of any supply of water which may be struck than to have a bare record of having bored so many feet. Sometimes the men are knocked off from boring work for a week while we are making these tests, and consequently the cost of boring is very much enhanced. Of course if these tests were not made the bores would be put down much quicker than they are—in some cases probably in half the time. I wish to lay before the Commission a report which I have prepared (*Appendix* L 5) as to the merits of the different boring machines which I have tried.

Cost increased by the tests.

1946. Would it not be possible to deduct from the total cost of each bore the cost which has been rendered necessary by the tests which you have made? Yes, I can produce a tabulated statement showing exactly how the time of the men has been occupied. (*Appendix* L 6.)

1947.

Mr. W. B. Henderson.

30 Oct., 1884.

1947. Would such information be available to-morrow, so as to be attached to your evidence as an appendix? It will take some time to work it out. I have tabulated all the work done by diamond drills last year, but I have not yet made out a statement of the work done by the water-boring machines.

Average cost of the whole of the bores.

1948. *President.*] Taking the whole of the bores, can you state approximately the average cost of the work? The cost of the labour is about 16s. 5d. per foot up to date for bores for water for public purposes. Taking the bores put down for private individuals the cost of labour is 15s. 5½d. per foot.

1949. Can you state the cost, including the carriage of material and other expenses? £1 12s. 11d. per foot. The carriage, it must be noted in these cases, is very heavy. I wish to put before the Commission a statement showing the quantity of water pumped from certain mines in the Ballarat Districts. (*Appendix* L 7.) I think that this statement is important, as showing that as there are such large quantities of water on the dividing range, much larger quantities may be expected to be found in the lower country further west. I also wish to put before the Commission an important letter which I have received respecting boring machines. (*Appendix* L 8.) In that letter it is stated that the cost of boring 1,330 feet for the South Pacific Petroleum Company in New Zealand was for labour £4,430, or £3 6s. 8d. a foot, and that the plant and tubing cost £6,650, or altogether over £11,000.

Large quantities of water in the lower country west.

1950. *Mr. Gipps.*] What machine was used? The Pennsylvania Oil-boring Machine.

Pennsylvania Oil-boring Machine.

1951. Is that similar to the "Tiffin"? It is more massive, and it is supposed to be capable of boring deeper than the "Tiffin."

1952. *President.*] Does not the engineer who put down the bore state that the cost would not have been nearly as much if a diamond drill had been used? Yes.

1953. *Mr. Gipps.*] Who superintended the working of the drill? A man who came from America with this Pennsylvania Oil-boring Machine, and who was paid £30 a month.

Wells between the Narran and the Barwon.

1954. *President.*] What do the circles on the map between the Narran and the Barwon represent? Wells; but we are putting down bores there.

1955. Can you give us any information about them? I have every belief that we shall get artesian water there, but we are not yet deep enough. The greatest depth of any of the bores is 153 feet.

1956. Is the country similar to that west of the Darling? No, it is quite different.

Bores on a branch of the Namoi.

1957. Is it not cretaceous? I think not; there is a lot of gravel there. I am also putting bores down on a branch of the Namoi; there are two bores down 280 feet there.

1958. Are they close together? No, they are some distance apart, but on the same station.

1959. Have you struck water? Yes, we have struck fresh water at 174 feet, which rose to within 80 feet of the surface, and again at 215 feet 10 inches, which rose to within 78 feet of the surface. Neither supplies are, however, artesian.

1960. In any quantity? 7,360 gallons per day from one bore.

Pressure of gravel drifts bursting the tubes.

Old river beds.

1961. What is the nature of the country which you are passing through? Immense gravel drifts, the pressure from which sometimes bursts up the tubes and fills the bore for 80 feet. The bore is in Mr. Capel's station, and he describes the strata which the bore tapped as being that of an old river bed.

1962. How far is it from any existing river bed? It is about 25 miles from the Namoi, and about 40 miles from Walgett.

1963. Is there no river bed nearer than that? I believe there are some small creek courses.

1964. Have you ever had anything to do with wells? I have obtained a large amount of information respecting them, which is contained in the document which I have already submitted. (*Appendix* L 3.)

1965. Do you know anything about the wells shown on the map on the Darling, near Walgett? They are private wells.

Wells west of the Darling.

1966. Have any wells been sunk by the Department west of the Darling? No; but I have obtained information respecting a number of wells in that part of the country, which information is contained in the paper to which I have just referred. I forgot to mention just now that I have three boring parties at work between Wilcannia and Silverton, but as the work has just been started no results have been obtained beyond the striking of salt water at 80 feet in one bore. The only part of the Colony respecting which I have not given information as to wells and bores is Riverina and the extreme north-west.

Bores near Narrabri.

1967. Have you any bores in the eastern part of the Colony? We have some bores near Narrabri in which the salt and fresh water are mixed; but I hope to succeed in getting fresh water, as the formation is similar to that between the Barwon and the Narran. I have been informed that from a bore put down on Mr. Bignall's Widgeegoara Station, in Queensland, made by a diamond drill to a depth of 250 feet, the water rises to a height of 40 feet under the surface. The force of water was so great that weights had to be put upon the tubes to keep them down.

Bore on Widgeegoara Station (Q.)

Section of bore on the Weelamurra Station.

1968. What was the size of the bore? I think it was about 3 inches where the water was struck. I wish to produce a section of a bore put down on the Weelamurra Station, in the Warrego District, by Mr. King, the owner of the station. (*Appendix* L 9.) First of all he started a shaft, but abandoned it at 30 feet or so, and from the bottom of the shaft started a 3-inch bore. At 38 feet from the surface fresh water was struck, the supply being equal to 1,000 gallons a day. At 60 feet salt water was struck, and this rose to 38 feet from the surface, the supply being about 1,000 gallons a day. At 230 feet fresh water was again struck, and this rose to 38 feet from the surface, the supply being about 1,000 gallons a day. At 300 feet brackish water was struck, which rose to 38 feet from the surface, the supply being 1,000 gallons a day. At 320 feet fresh water was again struck. This also rose to 38 feet from the surface, the supply being about 750 gallons a day.

Artesian water.

1969. Do you not think it would be advisable to start the tube from the surface, so as to ascertain whether the water is artesian or not? The chances are that unless the tube is very deep the water will not rise to the surface. I imagine, from the fact that all the water struck has risen to the same level, that there must be a fissure or fault in the rocks there through which it escapes. I have known instances where water has been pumped by steam-power into the tube, and not risen above a certain level.

1970. *Mr. Franklin.*] The Boring Department has been in existence for two years? Yes.

1971. And all its operations have been recorded? Yes.

Expenditure on each bore.

1972. So that the actual expenditure on each bore would be known? Yes; the most minute information can be obtained from the Department, as I have furnished returns giving particulars of the work from day to day. We did very little work in 1883, and we have not properly started yet. I did not believe in rushing the Department into heavy expenditure until I had tested the various boring machines. I have found many machines perfectly useless. I can at the present time buy American-made machines, which

are

Mr. W. B. Henderson. 30 Oct., 1884.

are supposed to be good ones. at the price of old iron. I refer to this subject more particularly in a report which I have submitted, and I have not condemned any machine without first giving it a fair trial. I have worked the "Tiffin" and the Wright and Edwards' machines together; they have been worked under the charge of one man, and at the same place, and I have kept a return showing the number of hours which they have worked and the cost of the work performed by each. It is almost heartrending to observe the great waste of money which is incurred by the use of some of these imported boring machines. Take the case of the New Zealand Company. The work done in that case ought to have been done three times over at the cost stated.

Trial of various machines.

1973. *President.*] Mr. Darley, in the evidence which he gave to us, mentioned an instance where, in America, an 8-inch bore has been put down 500 feet and tubed in 11¼ days at a cost of 6s. 8d. per foot? It is not difficult to bore at that rate; it all depends on the nature of the strata. I have put down 100 feet in 26 hours with an Australian-made machine, and in differing strata it might take 6 weeks to pierce as many inches. The difficulty which we have to contend against here is the swelling clay. You may bore a hole to-day and find it filled up again in the morning, and have to re-bore it.

Australian-made machine.

1974. *Mr. Donkin.*] Do you know anything about the Pierce borer? Yes; I know that under Captain Matthews' supervision one was used at Temora. It worked very well until he got down to the reef rock; it was of no use after that. The last time I saw it, it was lying at Temora out of use. The machine is one which is thought highly of in America. The Pennsylvania oil-borer would be successful when boring in Sydney sandstone or shales, but it is not suitable for swelling clays and drifts.

SATURDAY, 15 NOVEMBER, 1884.

At Narrandera.

Present:—

Mr. BARTON, M.P.,	Mr. GIPPS, C.E.,
Mr. DONKIN, J.P.,	Mr. LYNE, M.P.,
Mr. FRANKLIN, C.E.,	Mr. MURRAY, M.P.,

Mr. M'MORDIE, B.E.

W. J. LYNE, Esq., M.P., President, in the Chair.

Mr. James Cochran, grazier, called in and examined:—

Mr. J. Cochran. 15 Nov., 1884.

1975. *President.*] Where do you reside? At Widgiewa, on Colombo Creek.

1976. The Colombo is an off-shoot of the Yanko? An ana-branch of it.

1977. And part of the water which would run from the Murrumbidgee into the Yanko would flow into the Colombo? Yes.

1978. For how many years have you known the Yanko and Colombo Creeks? Twenty-five.

1979. Did you reside in the locality before the Yanko cutting was made? Something, but not very much, had been done to it before I went there.

Murrumbidgee waters running down the Yanko.

1980. Can you give us any idea as to how often the waters of the Murrumbidgee used to run down to the Yanko before the last cutting was made, taking a series of years? It used to run down a slight distance whenever there was a great flood; but unless there was a flood the water never ran down.

1981. How often has the water run down the cutting? It has run a slight distance down every year since I have been there.

1982. As far as Widgiewa? No.

1983. Have you any records showing how often the water has run down to the Yanko since and before the present cutting was made? No; but I think that it has run down much oftener since the present cutting was made.

1984. Taking a series of years, how often has the water run sufficiently far to be available to any number of people? It has been available to people a short distance down, but not to those below.

How far the water runs down.

1985. How far does the water generally run down? For several years it has not run further than Goree Station on the Yanko. I have known it to get as far as Bundure, which is the next station, but for the last five years it has not reached the next station—the Yanko.

Height of Murrumbidgee to permit the water to run down Yanko Creek

1986. How high has the Murrumbidgee to be above summer-level before the water will run down any distance? We need not expect any great quantity of water to flow down the Yanko unless the river is at least 10 feet above summer-level.

Dams on the Yanko.

1987. Are there many dams on the Yanko? There are none for a great distance. The first of any size is at Bundure Station; there was one at Goree Station, but it was cut away.

1988. Does the dam at Yanko Station prevent the water from flowing lower down? Oh no; all the dams that I know of have proper off-shoots to turn the water into the main channel after the dams are full.

1989. Are there many dams on Colombo Creek? Yes.

Effect of dams on Colombo Creek.

1990. What effect have they on the water lower down the creek? The Colombo Creek would not hold water at all if it were not for the dams; there are no natural water-holes in it. When one dam gets full the water passes over the by-wash into the creek and fills the next dam, and so on; and by these means the supply is retained.

The selectors' need of water.

1991. Are there many selectors on the Yanko and Colombo Creeks? There are a great many on both of them, but more on the Yanko than on the Colombo.

1992. How are they off for water at the present time? A great many of them are badly off.

1993. Have they made provision themselves by constructing dams in the creek, or have they made dams off the creek? Some of them have tanks off the creek, but I don't know that any of them have dams.

1994. Then they are dependent on the creek water for their supply? I think so.

No water runs down the Yanko in summer.

1995. Do you often get the water from the Murrumbidgee into the Yanko in December, January, or February? It is never known to come down as late as those months. I remember one occasion though when the water came down in December from a great snow-flood.

1996. But there are not often snow-floods in the Murrumbidgee? No.

Mr. J. Cochran.

15 Nov., 1884.

1997. Have you any idea as to why there is so little snow water in the Murrumbidgee compared with that in the Murray? I am not sufficiently acquainted with the country at the head of the rivers to give an answer to that question.

Supply of water in the Yanko.

1998. Does it appear to you that if the proposed cutting from the Murrumbidgee to the Yanko is made in any reasonable way so as not to interfere with the interests of persons down the river, the people along the Yanko would be well supplied with water? I think so; I think that the scheme is a feasible one.

Amount of supply wanted.

1999. Speaking as a representative man on those creeks, can you say whether it is the desire of the people on the Yanko to divert any large quantity of water? Not more than will keep a supply from year to year. We do not wish to use the water for irrigation purposes—we merely want a supply for stock.

2000. Suppose a supply were provided at certain times during each year to enable people to fill their dams and tanks, would that be satisfactory to them? Speaking for myself, I may say that that is all I want.

Irrigation on the banks of the creeks.

2001. Is there any large amount of irrigation carried on on the banks of the creeks? Not that I am aware of.

2002. Do you yourself irrigate? I have a dam in the creek from which I raise water for my garden, but that is done on a very small scale.

System of dams.

2003. In placing dams on the creeks would you recommend large dams or over-shot dams? Over-shot dams would not be suitable for the creeks, as they would not retain a sufficient supply of water.

Tanks useless through evaporation and soakage.

2004. Would there not be a sufficient supply of water if tanks were excavated above the dams? No, the soakage and evaporation are so great that any supply which would be kept by such dams would be totally inadequate. I have known water to soak away and evaporate from a dam in the Colombo Creek to the extent of from 8 to 10 feet in the course of a summer; that is, the depth would be reduced from 15 or 16 feet to 8 feet.

2005. But were not the stock watered from the dam? Yes, but the proportion of water consumed by the stock was very small in comparison with that which soaked away and evaporated. Probably not more than from 3,000 to 4,000 sheep were watered at the dam.

Necessary height of Murrumbidgee to secure sufficient supply.

2006. At what height of the Murrumbidgee should water be allowed to run down the Yanko to be of any service to the people on the creek? I do not think it would be of any use at less than 10 feet above the summer level.

2007. Do you think the water ought to be tapped at, above, or below summer level? I think summer level would be sufficient.

Locks.

2008. Do you think the water ought to be allowed to run down the cutting by gravitation, or that there ought to be locks in the shape of sluices? I think that an open drain would be quite sufficient. I do not think that any sluices will be needed if the work is carried out on the scale proposed.

2009. Would you propose to take the water at all times when the river was a certain height? Yes.

Nature of soil along creeks.

2010. What is the nature of the soil along the creeks? In some places the creeks run through sand-hills, in which the water soaks away to a certain extent, and in other places the beds of the creeks are composed of hard cement.

2011. What is the nature of the soil where the tanks and dams have been made? It is of a spongy nature—black loose soil.

Loss of stock

2012. Have there been any great losses of stock in that country, owing to the want of water? Yes.

2013. Do you think that such loss would be obviated to a great extent if the water were diverted as proposed? I am certain of it; great losses are occurring even now.

Soakage.

2014. *Mr. Barton.*] Can you give us any idea as to the amount of soakage which takes place when the creeks are running at full-flood or at half-flood? I cannot say. Of course a certain amount of soakage takes place when the river runs over the dry beds.

Velocity of water.

2015. When there is a full head of water running into the Yanko cutting, have you any idea as to the rate at which the water travels down? It depends on the height of the water at the back. I have known it to come down rapidly, but when the bed of the creek is dry, the first water does not come down at more than from 1 to 2 miles a day.

Length of the Yanko.

2016. What is the length of the Yanko Creek, taking all its bends? I should think about 300 miles.

Shortening by straight cuts.

2017. From your knowledge of the country, do you think it would be possible to shorten the distance by making straight cuts? That might be done, but I do not think it would be advisable; I think it would be better to follow the old channel.

Lowest level of Murrumbidgee.

2018. Have you known any year in which there has not been a considerable rise in the Murrumbidgee? This is the first season in which I have known the Murrumbidgee to keep as low as it has been.

2019. Has the river never been higher this season than it is now? I do not know what the height is now, but according to the gauge at Wagga Wagga, the height has not been more than 8 feet above summer level this season.

Taking the water at a low level.

2020. What advantage would be gained by taking the water at a low level, if, as you say, the river has never been known not to be flooded during the course of a year? In making a cutting in the way proposed, the width of it will always ensure us a small supply of water, which we do not get now when the river is low.

Lessening the loss from soakage.

2021. *President.*] If the bed of the cutting were kept constantly soaked, the loss of water by soakage would be very much less than it is now? Yes.

When the water is most required.

2022. Is it not when the river keeps low for a length of time, as it has done this season, that you require the water more particularly? Yes; we do not require it so much in seasons when the river rises several times.

Lake Urana.

2023. *Mr. Franklin.*] How far is Lake Urana from your run? In a straight line, about 20 miles.

2024. Does the water flow freely from Yanko Creek into Urana Swamp in flood-time? The swamp has no connection with the Yanko Creek; it is fed from the Urana Creek, which rises in the mountains, and from Coonong Creek, which rises in the plains.

2025. Is the water shallow in Urana Creek? Yes.

Dams on Urana Creek.

2026. Then it would not be possible to utilize it for storage purposes? There are some dams upon it which keep a supply of water for the season.

Urana Swamp as storage reservoir.

2027. Could Urana Swamp be utilized for the storage of any large quantity of water? I have seen a large sheet of water there which came from the overflow from the Murray.

2028. Do you think that if the water which goes into the swamp were diverted it would be of any use to the people there? I do not think it would be of the slightest use to the Yanko or Colombo country.

Mr. J. Cochran. 15 Nov., 1884.

The Billabong Creek.

2029. What is the area of the Billabong country, from its entrance to the Murrumbidgee to its outlet? The Billabong is not fed directly from the Murrumbidgee—it has an independent head of its own. The return water from the Colombo Creek goes into the Billabong at a certain distance down, but the Billabong has a stream independently of that. Of late years, however, the principal source of supply in the Billabong has been from the Murrumbidgee, through the Yanko and Colombo Creeks.

The area of the Yanko Cutting.

2030. There being such a long distance as 300 miles over which to convey the waste water of the Murrumbidgee, the area of the present Yanko cutting is not sufficiently large? Not at all.

2031. I suppose that if there was simply a passing flood in the river, you would not get any benefit from it at your station? No; the water from the Murrumbidgee has not run down to the Yanko Station for the last five years, notwithstanding that the river has been at least five times above summer-level.

Cutting silted up.

2032. *President*] The cutting has silted up very much since it was made? Yes, several new bars have formed, from stuff silting up, and drift-wood collecting, and the station-holders have periodically sent out men at their own expense to remove those bars.

2033. What was the cause of that? I think that the earth which was removed from the cutting was placed too near the edge of the bank.

2034. Was the cutting more serviceable before it was silted up than it is now? Yes; every new bar which forms stops a certain quantity of water from coming down.

th of water Urana Lake.

2035. *Mr. Donkin.*] What is the greatest depth of water in Urana Lake? I think about 10 feet.

2036. Has the lake any natural outlet? Two creeks run into it, but I do not think that it has any natural outlet.

Cockateegung Creek.

2037. Does not the Cockateegung Creek run from the Urana Lake into the Billabong? It might do so in time of great flood, but I have never known it to do so. My idea is that the water would have to be raised by artificial means before it would run into Cockateegung Creek.

Water going down the Yanko and the Colombo

2038. In flood-time what is the discharge of water from the Yanko into the Billabong? Three-fourths of the water goes down the Yanko, and one-fourth down the Colombo.

2039. Is there any connection between Colombo Creek and Yanko by Turn-back Jemmy Creek? I am not aware of any such connection.

Time necessary for the water to reach junction of Yanko with Colombo.

2040. Supposing there were a 10-feet flood in the Murrumbidgee, how long would it have to run before the water would go through the cutting to the junction of the Colombo and Billabong Creeks? I should think from six weeks to two months.

Benefit from proposed cutting.

2041. *Mr. Gipps.*] How many people would be benefited by making the proposed cutting in the Yanko Creek? There are a large number of residents on both creeks, but I cannot say exactly what the number is. There are several townships and small settlements along the creeks.

2042. Have not all the people made provision for water supply by constructing dams? Nearly all the station-holders have dams, but the selectors have not. They have tanks in the back country, but they get the benefit of the station-holders' dams.

Effect of cutting on tanks.

2043. Would a cutting fill those tanks? No, they have been constructed in the back country to catch the surface water.

Capacity of dams on Yanko Creek.

2044. What is the capacity of the dams in the Yanko? It is only the bed of the creek that holds water, and the dams are long, deep, and narrow. They have all been constructed with proper by-washes.

Fall of creek.

2045. What is the fall of the creek per mile? Not much more than two or three inches.

Under-current.

2046. Is there any under-current? There may be in the sandy bed of the Yanko, but I do not think there is any in the Colombo.

2047. *Mr. M'Mordie.*] You say that the water has been about 8 feet above summer level this year? Yes.

2048. If the dams had been filled at that time, would there have been a sufficient supply in them now? Yes, but none of them were filled—the water did not run down as far as the dams.

2049. All that you require is a cutting that would fill the dams when the river rises about 8 feet? Yes.

2050. Would not a constant supply of water at a low level be advantageous to the selectors who have not dams? Yes.

The payment of a rate.

2051. *Mr. Murray.*] Do you think that the people who would be supplied with water by means of the proposed cutting would willingly submit to a rate to pay the interest on the cost of the work? I think they would be quite willing to do so—I know that I should be. The matter is urgent, and this is the proper time to commence the work.

2052. *President.*] As legislation would be necessary before Water Trusts could be formed, would the people along the creek be prepared to pay a portion of the cost of the work and guarantee interest on the remainder, supposing the work were carried out by the Government? A proposal of that kind was made some time ago, but it never assumed tangible shape. If the carrying out of the work hinged on that I have no doubt the money would be found by the residents on the creeks.

Mr. George Mair, grazier, called in and examined:—

Mr. G. Mair. 15 Nov., 1884.

2053. *President.*] Where do you reside? At Groongal Station, on the Murrumbidgee.

2054. You have had considerable experience in irrigation works and works for the conservation of water? I have had a good deal of experience.

Experience in irrigation.

2055. Where? Chiefly on the Darling.

2056. Did your experience extend over many years? I had charge of one property on the Darling for eight years.

Conservation and distribution of water on the Darling Tallywalka Creek.

2057. From your knowledge of that river, do you think it possible to adopt any scheme for the conservation and distribution of water? There are a great many outflows from the Darling which, by means of cuttings or locks in the river, might be made to distribute an enormous quantity of water over the back country. There is a creek called the Tallywalka an ana-branch of the Darling, from which another creek flows, which is called the Terryaweynya Creek, which spreads into a number of lakes. Some of the station-holders there put a dam across the Tallywalka Creek, at a cost of £3,000 or £4,000, and the effect of that dam was to throw the water into a series of lakes extending north and south, a distance of 80 miles, and I should think giving several hundred miles of almost permanent water frontage.

2058. Do you think a scheme of that kind could be adopted in other places? There are many similar places on the Darling. There are a number of lakes filled from the Darling, some by creeks which do not run a long course, but into which cuttings have been made to keep them full. As far as I can judge, not being

Mr. G. Mair.

15 Nov., 1884.

being an engineer, I think it possible that works of this description might be carried out to a very large extent there—much more so than on the Murrumbidgee.

Diversion of water by cuttings without weirs.

2059. To raise the water it would be necessary to erect weirs across the Darling, below the outflows? That is a question upon which I should speak with some diffidence, because I do not know the levels. I took some levels connecting the Tallywalka with the Darling, and in some places I ascertained that by making comparatively inexpensive cuttings water might be diverted into that creek when the river rose, without the necessity for weirs.

Banks of the Darling.

2060. Are not the banks of the Darling nearer the river higher than the country beyond as a rule? Not as rule. The Darling is like all our other rivers,—in places there is a high bank on one side and on the other side is low land, a large area of which is flooded at times.

Construction of locks to allow navigation.

2061. If weirs were erected across the Darling and locks constructed to allow steamers to pass, do you not think it would be a benefit to the navigation? Unquestionably.

2062. And at the same time a large quantity of water could be diverted into the dry country? Yes, provided the weirs were a sufficient height.

2063. Have you had any experience of irrigation on the Darling? No, but I have had experience of it to a small extent on the Murrumbidgee.

Irrigation.

2064. Do you think that irrigation could be carried on to any extent on the Darling? I should not like to express an opinion on that point. I have had irrigation carried on at my homestead on the Murrumbidgee during the last four or five years, but not on any extensive scale. I raise water by means of pumps.

Expense of preparing land for irrigation.

2065. Do you find that there is much expense in preparing the land for irrigation? I have not carried on the work in a scientific way at all, but have merely thrown the water over the land. I find that by irrigating in a rough way I have been able to get crops of hay, wheat and oats, by way of experiment, and I have produced small patches of maize and English grasses; but I have not made any calculations as to the cost, and I should not like to offer any opinion as to the profitableness or otherwise of the work.

Effect of irrigation.

2066. I suppose that the difference between irrigation and non-irrigation is that in one case you are sure of getting a crop and in the other you are not? Yes, without irrigation we cannot be sure of getting crops, unless we have an exceptionally good season. I have a fairly good crop on 40 acres of land which I have irrigated this year. Seed was sown at the same time on land which was not irrigated, and there was no crop at all on it.

Number of immersions per year.

2067. How many times in the year do you irrigate the land? I flood the land three times while the crop is growing.

Stand of Murrumbidgee, near Groongal.

2068. Has the Murumbidgee been very low near Groongal this year? In the early part of the year it was exceedingly low. It usually reaches the lowest level about March.

2069. Do you know anything about the cuttings into the Yanko? No.

Effect of diversion into the Yanko on the water in the Murrumbidgee.

2070. From what you have heard about the proposal to deepen the Yanko cutting, do you think that the river water would be much affected lower down if a small portion of it were diverted into the Yanko at certain seasons? People below would not be affected unless the water were taken at a time when the river was at its lowest. Water might well be spared when the river was as high as it is at present. If any considerable extent of water were taken from the river when it was at a lower level than it is at present, it would occasion great inconvenience to the people below, particularly about Hay, Balranald, and in the back country there. It is a matter of life and death to people to have the river navigable. As long as the navigation of the river was not interfered with, property-holders below would not be materially injured. I do not think it would matter how wide the cutting was made, as long as it was not made too deep.

2071. Setting navigation aside, do you think that the diversion of the water as proposed would have any appreciable effect on the flow of the river? If the water were taken off in a wide cutting at a summer level unquestionably it would.

Determination of summer level.

2072. When the river is down to what is termed summer level, what is about the depth of water that flows over its bed? The summer level is an arbitrary term—there seems to be no rule by which to determine it. I have seen the river so low that in the deepest part it has not been more than 18 inches—the water would not come up to the horse's knees.

Hard clay bars.

2073. What is the nature of the bed at that spot? In places where the river is shallow there is usually a hard clay bar. I have frequently seen the river with not more than 18 inches of water in it at the deepest part.

Velocity of water.

2074. Was the water running rapidly? No, at about from 2 to 3 miles an hour.

2075. I suppose you have often seen the river in flood? Yes.

Ordinary floods.

2076. What area of land would be covered by flood between Groongal and Hay? The river scarcely rises beyond its natural banks in ordinary floods.

Area of flooded country.

2077. But suppose the river overflows its banks, what area of country would be overflowed by its waters? I should think there would be an average width of about half a mile, that is on one side.

Rapidity of rise of floods.

2078. Does the river rise rapidly at flood-times? When there are heavy floods it rises rapidly. In 1870 it rose from 15 to 16 feet in one night, but that was an exceptional case.

General system of irrigation.

2079. Do you think that any general system of irrigation could be carried on from the river? I do not think there would be sufficient water in the river for irrigation purposes when the water would be most required. Although I have been irrigating on a comparatively small scale, I should be quite prepared to have exception taken to my operations if I irrigated when the river was low. If half a dozen people would do as I do, the people below would certainly have a right to complain. With the river at its present height, irrigation operations have no appreciable effect on the volume of the river; but when the river was very low, a few large steam pumps would draw nearly all the water out of it.

Natural depressions of ground near the Murrumbidgee.

2080. Do you know of any natural points on the Murrumbidgee where the water might be diverted into depressions, and thus form lakes? I do not. There are some lakes near Balranald, but there are no ana-branches of any importance in this part of the country, and no depressions into which water might be diverted. This remark applies particularly to the northern side of the river. On the south side there is a creek called the Gum Creek, which is an ana-branch of the river, flowing out of it about Kerarbery, and again flows into the river about Burrabogie. This creek has branches extending in various directions on the plain, and several of these outflows are of considerable value to the squatters.

Importance of the flood spreading over the country.

2081. Do you consider it of much importance that the flood-waters of the river should be allowed to spread over the country? It is of importance to people about Balranald and at the junction of the Lachlan and Murrumbidgee. There is a large extent of land there the value of which entirely depends on the yearly inundations by floods in the reed-beds and polygonum swamps.

2082.

Mr. G. Mair. 15 Nov., 1884.

2082. In what way does the value of land depend on inundations by floods? Because the land grows grass only after the land has been flooded. In some cases these polygonum swamps extend 10 or 12 miles from the river, and that country is of very little value except after floods; it is comparatively valueless for grazing unless it is periodically flooded.

Murrumbidgee always running.

2083. *Mr. Barton.*] Have you ever known the Murrumbidgee to run dry or become a chain of water-holes? No, the river is always running.

Effect of diversion of water at summer level.

2084. Apart from the question of navigation, in what way would the people below be affected if the water were diverted from the river at summer level? By reducing the supply of good water. When the river has been low I have known the water to be quite unwholesome in consequence of there being so many carcasses of animals in it. I have seen the river so low that my sheep could cross from my station to that of my neighbour on the other side of the river. There is scarcely a year in some part of which the sheep cannot get across. You will see by this that people below would be very materially affected if the water were reduced to a still lower level, because in many places the river would then be no longer a natural fence.

2085. I suppose if the river were not interfered with below from 1 to 3 feet below summer level those people would not be affected? Not materially.

Level at which diversion will not be injurious.

2086. *Mr. Murray.*] At what depth below the present level of the river do you think the water might be diverted without injuring the people below? If it is a mere matter of water supply for stock and domestic purposes the river might be several feet lower than it is at present; but you have to consider the importance of the navigation and the inundation of the low lands to which I have previously referred.

Navigation.

2087. Could the river be reduced below the present level without affecting the navigation? I think scarcely not—the river would not be safe for navigation if it was much lower than it is at present.

Effect of the Yanko cutting on river level.

2088. *Mr. Franklin.*] The river at the point where the Yanko cutting is made is about 300 feet wide, by a mean depth of about 10 feet, which gives about 53,000 cubic feet, and the area of the Yanko cutting is only about 200 feet, so that the cutting could only intercept 1-215th part of the entire flow of the river; this would probably lower the river by about one quarter of an inch: do you think that would affect the people at Hay? If not more than 1-200th part of the supply of water in the river were intercepted I do not think any one would object.

Quantity of water raised at Groongal Run.

2089. Have you any record of the quantity of water which you raise for the purpose of irrigation at your station? When I am pumping for the purpose of irrigation I raise probably over 3,000 or 4,000 gallons per minute. I keep the pump working all day. This year I think the pump has been working about three weeks.

2090. What is the area of Groongal Run? About 300,000 acres.

Consumption of water.

2091. Do you think the other run-holders on the river consume as much water proportionately as you do? Very few of them do any irrigation. I think there are only one or two who consume more water than I do.

2092. I suppose we may assume that all the station-holders on the river consume as much as you do for various purposes? I should say that where we irrigate we consume more than a fair proportion of water.

Tallywalka and Teryaweyna Creeks.

2093. *Mr. Donkin.*] Does the Tallywalka Creek flow into the Teryaweyna? The Tallywalka Creek is an ana-branch of the Darling, and the Teryaweyna Creek is an outflow from the Tallywalka.

2094. Do you know whether there is any water in the lake there? I believe not.

2095. How is the dam to which you have referred standing? It is standing perfectly well.

2096. Is the creek a deep one? The Tallywalka is a deep channel, and the effluence to the Teryaweyna is about 6 feet higher than the bottom of the Tallywalka, where it flows out.

Polygonum swamps near Balranald.

2097. Would not a high flood cover the polygonum swamps, near Balranald? Yes, and in times of flood all the water you could take down the Yanko would be of no consequence as affecting the Balranald country.

River traffic.

2098. *Mr. Gipps.*] What is about the value of the river traffic at Hay and Balranald? I could not state, but it is not of so much importance to Hay now that they are connected by railway with the metropolis as it is to Balranald.

Width of river.

2099. What was the width of the river at the point where you stated it was only 18 inches deep? The total of the surface of the water was about 20 yards. It was not more than 18 inches deep at the deepest part.

Inundation level at Balranald.

2100. At what height would the river have to be to flood the country near Balranald? I cannot say exactly, but probably 15 feet.

2101. Then if a movable weir 15 feet high were erected, it would answer the same purpose. Yes.

Insufficiency of Murrumbidgee waters for irrigation.

2102. *Mr. M'Mordie.*] Your idea is that there is not sufficient water in the Murrumbidgee to admit of irrigation being carried on on a large scale? Yes.

2103. Then if irrigation is to be carried on in the country between the Murray and the Murrumbidgee, the water would have to be obtained from the Murray? I suppose so.

Flood level.

2104. *Mr. Donkin.*] How high would the river be above summer level before you considered it in flood? Anything over 10 feet.

Fall from and to the river.

2105. *Mr. Franklin.*] Is there not a natural drainage northwards? By taking a north-westerly direction you get a fall as far as you like to go; if you go in a westerly direction you get a fall to the north as well; but if you go due north, taking a long course of miles, I should say the fall is towards the river.

2106. You say that in the direction in which there is a fall you do not know of any natural depression in which large quantities of water might be stored? There are none that I know of, of any size.

Height of banks.

2107. *President.*] What is the height of the banks of the Murrumbidgee? At Groongal I should say that the height of the bank from the lowest level at which I have seen the water is about 21 feet.

Mr. John Alford called in and examined:—

Mr. J. Alford. 15 Nov., 1884.

2108. *President.*] How long have you resided in this district? About twenty-one years.

2109. You have been employed in sinking wells? Yes.

2110. During the whole of the time that you have been in the district? No; for about fifteen or sixteen years.

2111. You have sunk wells on both sides of the Yanko? Yes.

2112. Have you sunk many between the Murrumbidgee and the Yanko? Yes.

2113. Were you in the district when the Yanko cutting was made? Not when the first cutting was made.

Mr. J. Alford.
15 Nov., 1884.

2114. Do you know how often water goes down the cutting? The Murrumbidgee has to be 8 or 9 feet above summer level before water will go down the cutting.
2115. Is it necessary for the river to be at that height for a considerable time before the water will run down the cutting? I think so.
Yanko cutting.
2116. As the water recedes in the river, so it recedes in the cutting? Yes.
Water lost in drifts.
2117. Do you know whether after the water goes down the cutting a certain distance it seems to lose itself? There are a number of water-holes which have to be filled; but I do not think that much water percolates through the soil.
2118. Do not you think that the water gets away in drifts? A little may soak away in certain places, but I know that the water stands for a long time in the holes.
2119. Is it not supposed that at Bundara the water gets away in a drift? I have not heard of it.
Depth of wells in the Tubbo country.
2120. What depth have you to sink wells in the Tubbo and surrounding country before you strike good water? We strike the first water at from 70 to 80 feet, but generally sink from 120 to 200 feet.
2121. Is there a large quantity of water where you first strike it? No.
Quality of the well-water.
2122. Is it good water? Sometimes it is good, but generally it is brackish; the second water is always as fresh as that in the river, and there seems to be an unlimited supply of it.
Nature of soil.
2123. What sort of ground do you sink through? Usually clay and drift. The second water is struck in drift which is as fine as flour.
2124. Is the second water always found in the same kind of drift? Yes.
Rise of water.
2125. When you strike the second water does it rise very high in the shaft? Yes, but never higher than the level at which we strike the first water; it rises to about 70 or 80 feet from the surface.
2126. Have you never known the second water to rise above the surface? No, I have not known it to rise an inch higher than the level of the first water.
2127. Do you think the water gets away in the drift at which the first water is found? No.
2128. How do you account for the water not rising any higher? I suppose that the source of the water is not much above that level. I have had tubing put down to the second water, but even then it did not rise above the level of the first water.
Source of the well-waters.
2129. Where do you suppose that the water comes from—from the present river? Not from the present river. I believe that it is an undercurrent, and that the water comes from the mountains.
2130. If that theory were correct the water would rise to the surface? I do not think that there is sufficient fall to force the water to the surface.
2131. You do not think that the water comes from the Murrumbidgee or the Yanko? No. In a well which we sunk about 40 feet from the river bank the water rose to within 80 feet of the surface, and although the whole of the flat was covered with flood-water the water did not rise in the well, therefore I assume that the water was in connection with the river water.
Limestone stratum.
2132. Do you pass through any cement bands in sinking? Sometimes we pass through white limestone.
Black clay with charcoal.
2133. Can you always tell at what depth you will get water? We can always tell when we are getting near the second water, because we pass through black clay with charcoal in it.
Underground water currents.
2134. Can you judge from the surface formation as to the depth which you will have to sink? Not always; I believe that there are different runs of water, and in some places we get the water 10 feet higher up than we get it in another place, but the depth is nearly always about the same.
2135. Have you ever struck salt water at the low level? No.
2136. How many wells have you put down in this part of the country? About thirty or forty; perhaps more.
Soil at Yanko cutting.
2137. Is that ground composed of cement where the Yanko cutting is made into the Murrumbidgee? It is sand and clay mixed.
2138. *Mr. Barton.*] Have you ever found any decayed timber in the drifts? No; but there is generally charcoal.
2139. Have you ever found any shells? No.
2140. *Mr. Franklin.*] Have you kept any record of the strata which you passed through in sinking the different wells? No.
2141. Why do you pass the first water? Because the supply is not sufficient.
2142. Do you adopt any means to keep that water out of the wells? No.
Size of wells.
2143. What is the size of the wells which you have sunk? 6 feet by 3 feet.
Depth to water.
2144. What is the depth at which you generally strike water? The deepest well which I have sunk is one of my own. It is 198 feet deep. The first water was struck at 80 feet. When we struck the second spring the water rose 110 feet in about three minutes.
2145. Has that occurred in any other well? Yes, in one which I sank for Mr. Duncan Robertson.
Exhaustion by pumping.
2146. Do you think it possible to exhaust the supply of water by pumping? No.
2147. Are there many such wells on the Yanko? Yes, I have sunk five or six wells like those on the Yanko.
Effect on supply of larger size of wells.
2148. Suppose that you were to enlarge the size of the wells to (say) 12 feet by 6 feet, do you think that you would get the same result? I think that there would be just as large a supply of water in larger wells.
2149. *Mr. Donkin.*] Have you ever found any large water-worn stones in sinking the wells? No, I have never found any stones larger than eggs.
Variation of water level.
2150. Does the height of the water in the wells vary? No; it is not affected by floods in the river, and it keeps about the same level winter and summer.
Time employed to sink a well.
2151. *Mr. Gipps.*] How long does it take to sink the wells? I have recently sunk one 102 feet in depth in three weeks; there were three men employed besides myself.
Cost.
2152. What is about the cost per foot? I find everything, and I get from 30s. to 35s. per foot.
Terms of contract.
2153. *President.*] The terms of your contracts are that you have to do the sinking and supply the timber, and strike water before you are entitled to any payment? Yes.
Wells marked on map.
2154. Could you mark on the map the localities of the various wells which you have sunk, and state their depth? Yes.
Effect of pumping.
2155. You said just now that you did not think that the water in the wells could be lowered by pumping? By pumping very hard all day you might get the water down a couple of feet, but in about two minutes it would rise to its ordinary level.

Mr. John M'Kersie was examined:—

Mr. J. M'Kersie. 15 Nov., 1884.

2156. *President.*] You are a selector on the Yanko Creek, I believe? Yes.
2157. Have you been residing there long? For nearly ten years.
2158. Do your selections front the creek? Yes.

The Yanko Creek.

2159. Have you found that the water has run down the Yanko for any great distance every year until the last? No; it has not reached us since 1879.
2160. How many miles down the creek are you? About 70 miles.
2161. Then you are below Yanko Station? Yes.
2162. Do you depend principally on the Yanko water for your stock? Yes, for the frontage blocks.
2163. What means of supply have you on the other blocks? Wells and tanks.

Quality of well-water.

2164. Do you get good water by sinking? Very good.

Depth to water.

2165. At about what depth? From 50 to 75 feet on many blocks.

Quantity of water.

2166. In what quantity? I have no idea of the quantity, but it is sufficient to water between three and four thousand sheep at each well.

Description of land.

2167. Have your frontage blocks been rendered almost useless for the want of water in the creek? Yes.
2168. Have you any portion of the country known as the Yanko Flats in your selection? Yes.

Quality of land.

2169. It is very good land? Excellent.
2170. Capable of growing all sorts of cereals? Yes, provided it is irrigated.
2171. Will it grow maize? I have had no experience in growing maize. The land will grow wheat and oats—in fact it is rich enough for anything.

Height of flat above Yanko.

2172. At what height above the bed of the Yanko is the flat generally? 20 to 25 feet.

Raising of water.

2173. Suppose a stream of water were to flow down the Yanko, in which way would you carry it on to the land? It could only be done by machinery.

Dams.

2174. Are there any dams where you are on the creek? Yes.
2175. Below you? Above and below.
2176. They have a by-wash? Yes.
2177. Is it your opinion that dams with a by-wash or overshot dams would answer the best? All the dams should be overshot.

Evaporation.

2178. Do you not think that the evaporation would prevent the supply from being permanent unless where there is a great depth of water? Not if the creek were to run every year; it would in the course of four or five years.

Permanent supply by overshot dams.

2179. Suppose you got a supply once every two or three years? An overshot dam 4 or 5 feet high would give a permanent supply for two years.

Storage of water for irrigation.

2180. Suppose the water flowed down the Yanko every year, could you store enough for irrigation to any large extent? I think so.

Effect of water running down the Yanko a month in a year.

2181. Would the selectors be satisfied if they had the water running down the creek for a month in the year? Yes, perfectly satisfied.
2182. That is without having a continuous stream? Without a continuous stream.
2183. Would such a supply greatly benefit the property of selectors in your neighbourhood? Yes, very much.
2184. Do they depend on their crops or on their stock principally? They combine agriculture with stock-raising.

Area of land held by selectors.

2185. What area of land do the selectors hold down there? From one to six or seven thousand acres.
2186. They combine depasturing stock with cultivation? Yes.
2187. If a scheme to supply water down there were carried out, would it prevent any of the selectors from leaving the Yanko? I believe it would.

Selectors leaving the district.

2188. Do you think that the hardships they have had to go through have had the effect of causing any selectors to leave the district? They are enough to frighten any one.

Selectors would irrigate.

2189. *Mr. Barton.*] Suppose the stream of water running down the creek were sufficient to provide for irrigation, do you think the selectors would avail themselves of the water for that purpose? I think they would.

Their willingness to pay a rate.

2190. In that case would they be willing to pay an annual rate? Yes, they would.

Value of land.

2191. Do you think that the effect of having running water down the creek once a year would enhance the value of the land on both sides of it to a considerable extent? Yes, very much so.
2192. To what extent? Land was bought on the Yanko three years ago for £2 6s. an acre, and to-day I do not suppose that you could get more than 30s. for it.
2193. If the water in the creek ran through once a year, what effect would that have upon the value? It would increase it to from £2 10s. to £3.

Width of Yanko cutting.

2194. *Mr. Murray.*] Do you know the cutting of the Yanko? Yes.
2195. Do you consider that it is large enough to supply the requirements of people on the banks of the stream? No.
2196. Do you know the proposed cutting? I have seen a section of it.
2197. What width of cutting would be sufficient, do you suppose, to supply a stream of water the full distance down the creek? I have no idea.

Enhanced value of property.

2198. To what extent do you think a constant supply of water would enhance the value of your own property? I should say that it would make it worth £2 10s. or £3 per acre.
2199. At what do you at present value it? I do not suppose that it is now worth more than 30s., in the present state of the market.

Payment of a rate.

2200. You would be quite satisfied to pay a liberal rate for the interest which would be required on the money needed for improvements? I would.
2201. *Mr. Barton.*] Are you aware that in some countries, California for instance, the effect of an unlimited supply of water has been to increase the value of land from 5s. an acre to £30 an acre? I have read so.
2202. *Mr. Franklin.*] You do not think it would be possible to improve the value of land here in the same ratio? It might be, in the course of years.

Sectional area of Yanko Creek lower down.

2203. Is the general area of the Yanko, as a water-carrying creek, much larger lower down than at the inlet? Much larger.
2204. In what proportion larger? Forty or fifty times as large as could be supplied through the inlet.

2205. The comparison might be something like the neck of a bottle to the bottle itself? The proportion would be much greater. Mr. J. M'Kersie.

2206. What is the length of the work which has been made by cutting—the length of the conduit—until it is lost in the creek? The creek has been made by cutting more or less for 14 miles, and some parts of the creek have been deepened. 15 Nov., 1884. Length of cutting.

2207. Could you give us any idea of the proportion which the inlet to the creek bears to the creek itself? I should think that the creek is capable of carrying forty or fifty times more than the present cut is capable of supplying. Water-carrying capacity.

2208. What distance would it be necessary to make the cutting to connect the Murrumbidgee with the full carrying capacity of the creek? About 2 miles, if I remember aright, according to Mr. James's plan.

2209. *Mr. M'Mordie.*] From the new inlet? No, the old.

2210. *Mr. Donkin.*] Do you know the Cudal Creek? Yes. Cudal Creek.

2211. Does any water run down it in flood-times? In high floods. If it ran through the Cudal Creek the flow would be very much greater than through the cutting.

2212. *Mr. Gipps.*] To guarantee an equitable allotment of water would it not be necessary to establish a Board of Trustees? I think so. Board of Trustees.

Mr. William Mooreland was examined:—

2213. *President.*] You are a selector, living at Yanko Creek? Yes. Mr. W. Mooreland.

2214. Do you live near Mr. M'Kersie? About 2 miles from him.

2215. You have heard his evidence? I have.

2216. Do you agree in all that he has said? I do. 15 Nov., 1884.

2217. You consider that the land down the Yanko, especially the flats, would be enhanced in value by a supply of water? I do. The land is good enough to grow anything.

2218. Have many selectors left? Yes; and a great many more would be glad to sell out now if they could get the value of their property. The rainfall seems to go down about as far as the water flows. Rainfall on Yanko.

2219. Do you consider that the conservation of water would attract larger rainfall? I do.

2220. Is there anything which you wish specially to place before the Commission? No; only this, that we want the water as soon as we can get it. Immediate want of water.

2221. *Mr. Barton.*] And you are willing to pay for it? Yes, if there is a rate levied, but not to subscribe the money and then pay a *pro rata* rate. Let the Government find the money, and we will pay the interest on it. Payment of rate.

2222. *Mr. Gipps.*] Would you have the matter placed under a Board of Trustees? No. Board of Trustees.

2223. *Mr. Franklin.*] How far is your holding down the creek? About 60 miles from here.

2224. With a small rise in the river, such as at present, or even with the river 2 feet higher, I suppose you would get scarcely any benefit from the quantity of water which would flow down the creek? No; it has not been down for five years. It went as far as Bundurce three years ago. Distance reached by the water in Yanko.

2225. Do you remember the height of the river at that time? I think it was about 19 feet.

2226. Above summer level? Yes.

2227. You do not take any record? We cannot down there.

2228. Is the reason that the water does not reach that distance, that the opening is not large enough to allow a sufficient discharge from the river? Just so.

2229. The Colombo would take all the water that flows through the cutting? The flow is to the Yanko more than to the Colombo—more to the right than to the left. When there is a flood there is water enough to fill both creeks. Waterflow to Yanko and to Colombo.

2230. What is the distance from the mouth of the cutting to the Colombo Creek? About 20 miles.

2231. *Mr. Murray.*] What do you consider would be the enhanced value of your property if you had a supply of water? It would be increased from about 20s. to £2 10s. I do not think that land can be sold now at any price. I have given £2 for land there with 15s. an acre to pay up. Enhanced value of property.

2232. *Mr. Donkin.*] The country is open plains? There is a good deal of boree in it.

2233. There is not much of it heavily timbered? No. Features of country.

2234. Has the timber any effect upon the rainfall? If the water were to flow down the creek, that might affect the rainfall. There is a good deal of pine and box in the back country, and there it is as dry as in parts where there is no timber. Rainfall.

2235. In times of heavy rain where does most of it fall? Sometimes more on the creek, sometimes more upon the timber—I do not think there is any general law.

2236. You do not think that you get more rain in the country where the trees grow? I think that we get more showers on the creek than further back.

2237. *President.*] Do you attribute that to the creek as well as to the timber? Yes.

2238. *Mr. Donkin.*] Has any ringbarking been done? Timber is too scarce for that.

Mr. Martin Brennan was examined:—

2239. *President.*] You live on the Yanko? Yes. Mr. M. Brennan.

2240. How far down? About 30 miles.

2241. Have you lived there a long time? About eight years.

2242. You have heard the evidence given by Mr. M'Kersie and Mr. Mooreland? Part of it. 15 Nov., 1884.

2243. Do you consider that your ground would be much improved in value if you had a good supply of water? Yes. Value of ground

2244. During the last four or five years how many times has the water run down to your selections? On an average there were three overflows in the year, except in 1878. How often the water reached the selections.

2245. How often have you had the water down this year? Three times.

2246. Is it sufficient to fill your tanks? No; the holes in the creek supply me.

2247. You have not attempted to irrigate? No. One year the creek went totally dry, and I used well water. Irrigation.

2248. What sort of water is it? Very good. Quality of water.

Mr. M. Brennan. 15 Nov., 1884.

2249. Has it any connection with the creek? I think the water I have tapped there has been tapped in all the wells within a radius of 20 miles.

Well connected underground with Murrumbidgee.

2250. Do you think it is connected with the creek? I think it is connected with an underground drift from the Murrumbidgee. Shallow wells have struck the water; my well is 61 feet deep; deeper wells supply a larger quantity. The wells which strike the lowest drift give any quantity.

Enhanced value of property.

2251. How much would your property be increased in value if you obtained water in any quantity? I could not say. Land will rapidly increase in value as water is permanent.

2252. Do you grow crops to any great extent? No.

2253. Would you if you were able to irrigate? No; I am not an agriculturist.

Quality of land.

2254. The land is capable of growing crops? It is very good land for cereal crops.

2255. What extent of land have you? My brother and I have 2,800 acres.

2256. You have some of the Yanko flats? About one-third of it.

2257. That land will grow anything? I think the timber land is better for growing crops than the alluvial flats; the flats are stronger pasture land.

Nature of soil.

2258. What is the soil? Black clay. I have never seen any grain crops tried on it.

2259. Have many selectors sold out in that neighbourhood? A few.

Effects of want of water.

2260. Would any of them stay if they had a better supply of water? Some would. Want of water has not been the main cause which has led many to sell out, but want of water will, I believe, cause others to sell out.

2261. It is absolutely necessary that the settlers should have a better supply? Every one feels it to be so.

2262. Do you know the country where Mr. M'Kersie lives? I have been as far as Jerilderie. They need the water to a greater extent there than we do. The further you go down the more is the water required. The dry bed of the creek absorbs the water as it leaves the Murrumbidgee, and the water diminishes in that way the further you go down until it ceases to run altogether. Once the bed of the creek is saturated a small quantity of water will be enough to make a flow.

Absorption of water in the creek-bed.

2263. Would the bed of the creek absorb much? Once it is dry it drinks up more than flows down, and it is not till the bed of the creek is well wetted that there will be any flow.

2264. When you have had a plentiful supply of moisture in the creek have you noticed that you get more thunder-storms? I cannot say that I have. I do not think that timber brings rain.

2265. Does water? Water produces fogs; but thunder-storms come north and south, and may extend a couple of miles across. The country will be quite dry on each side. I was told by an old resident that in

Murrumbidgee partly dry in 1839.

1839 the Murrumbidgee was running at Jugiong, and that it was quite dry 15 miles this side, at Oakey Creek; it was running again at Jones's Flat 6 or 8 miles this side of that; it was running again at Buck's Island, 8 or 10 miles beyond Wagga; and again at Deepwater.

2266. How far down is that? Mr. Devlin's, 30 miles above Narrandera. Then the bed of the river was dry until you got to Burrabogie; it was running again below Burrabogie.

2267. Was it a sandy bed where the water was not running? Yes; and the water was procurable in the sand. In 1851 I was able to walk across the Murrumbidgee, although there was some water in it.

2268. Where was that? Above and below Gundagai.

2269. At what time of the year was it? In December, January, February, and I think later.

Loss of water in drift.

2270. Your theory is that the water is lost in the sand? Yes, in the drift.

2271. It does not sink into the bed of the river and reappear at another point? It sinks into the drift, which has a clayey and rocky bottom. At the time at which I refer, it was running at Hay at a lower level.

Mr. John Witcombe was examined:—

Mr. J. Witcombe. 15 Nov., 1884.

2272. *President.*] You are the Mayor of Hay? Yes.

2273. And you have come from Hay to meet the Commission? Yes.

2274. The people living down the river are, I understand, rather anxious as to what is to be done in diverting water from the Murrumbidgee? I think it is in consequence of their anxiety that the Commission meet here to-day.

State of river at Hay.

2275. Has the Murrumbidgee been very low at Hay this year? About the beginning of the year—in February and March—it was so low that I could step across it, and we had to concentrate the flow to supply our water-works.

River-bed.

2276. Is the bed of the river composed of sand? On one side.

River dammed.

2277. I suppose there would be water all through the sand? We did not try it; we partly dammed it with the sand.

2278. But still it would percolate through? I suppose a little would.

Width of stream.

2279. What was the width of the stream flowing when you dammed it? About 7 feet. I jumped across it one day.

Depth of stream.

2280. And what depth? About 3 feet, running amongst logs. We dammed it in a narrow place where there was a sand-drift, and by that means we raised it about 2 feet, directing the water into a channel which supplies our water-works.

2281. Were you at Narrandera at that time? No.

State of river at other points.

2282. Could you form any idea of the quantity of water which was flowing past Narrandera at that time? No.

2283. Or at any other point of the river besides Hay? No.

2284. Have you any knowledge as to what proportion of water is lost by percolation through the bed of the river, or otherwise, between Narrandera and Hay? I do not think that there is very much lost. There is one place above Hay where teams are crossed to avoid paying the toll which is levied on the

Hard cement bottom.

bridge; there the bottom is very hard cement.

2285. But there may be points along the river's course where the water may get away—have you heard the evidence given by John Alford this morning? Yes.

2286. It is just possible that a great deal of water may leave the river? Yes.

2287. And it may get away between Narrandera and Hay? Yes.

Water lost between Hay and Narrandera.

2288. Have you any idea that it does? I have seen the river running at Wagga, at Narrandera, and at Hay; and at Hay the volume of the water would be very little less than at the other places.

2289. You accompanied the Commissioners yesterday to the proposed Yanko cut? Yes. 2290.

Mr. J. Witcombe.

15 Nov., 1884.

2290. And you saw the plans and heard the various ideas expressed on the subject? Yes.

2291. Do you think if a cutting was made as proposed—1 or 2 feet above summer level—to divert water into the Yanko, that would materially affect the river at Hay? Yes.

Effect of Yanko cutting on supply at Hay.

2292. The proposal being 1 or 2 feet above summer level? It might draw off all the water and would certainly divert the course of the river if made 2 feet below summer level as proposed.

2293. If the diversion of the water was controlled by sluices, would the people of Hay have much objection? They would not object to anything being taken above navigation point.

Water Trust.

2294. Would it be more satisfactory if the matter were placed under some definite head? It would be much more satisfactory; it is the opinion of people on the lower parts of the river that there should be a Trust.

Objection against diversion at summer level.

2295. There is a great objection to diverting the water when the river is at or near summer level? There is; we know from past experience that the water would be so much polluted as to be unfit for use for domestic purposes.

2296. The small cutting proposed would not affect the flood-waters? No; but if the diversion was made as has been suggested, considering the great difference in the height of the railway levels at Narrandera and Hay, there is great danger that the interests of Hay will be seriously damaged.

Difference of level at Narrandera and Jerilderie.

2297. You are referring to the railway levels? Yes, as given in the time-tables, which we assume to be correct. We find that we have 574 feet at Narrandera, and at Jerilderie, which is 65 miles distant, the height is 361 feet. There is therefore a fall all along the creek from here, and if the water does not flow it must be owing to the faulty construction of the channel.

Fall of Yanko Creek.

2298. You think there is a fall of about 4 feet to the mile? It is over 3 feet.

2299. You do not know the difference between the railway levels and the river or water levels? No, but I should think there is not more than a difference of 50 feet. That is a matter to be ascertained by the engineers.

Level at Darlington.

2300. Suppose we reduce the difference of the railway levels by one-half, that would give a fall of 2 feet or 1½ foot to the mile all the way down? Yes, at Darlington, which is 60 miles from here, the level is 412 feet.

Level at Hay.

2301. What is the level at Hay? I think 305 feet, but I cannot say for certain: it is not given for all the stations.

2302. How far is it from Narrandera to Hay? 101 or 102 miles.

Fall of Murrumbidgee.

2303. By comparison with the level at Darlington it would appear that you have a 3-feet fall? We do not know that we have the same at Hay—we do not think we have so much. If we had, it would bring us down a long way below 300 feet. The fall of the country seems to be towards the Murray River. Echuca is 320 feet, and Deniliquin about the same.

Depression of country between Murray and Murrumbidgee.

2304. As a matter of fact we have it in evidence that the depression in the country between the Murray and the Murrumbidgee is generally lower than the banks of either of those rivers? Yes, the Yanko Creek goes into the Edwards, which flows into the Murray; and that shows that if a large cutting were made and the water were admitted to it without regulation the ordinary flow of the Murrumbidgee might be diverted down the Yanko, and we at Hay should be left with the floods-waters only.

2305. When the Murrumbidgee is in heavy flood, the great volume of the water flows past Hay? Yes, and runs to waste.

Principal fall.

2306. That would show that the principal fall and largest outlet is at Hay? Yes.

2307. If a cutting were made under the Yanko, portion of the flood-waters would be diverted from Hay? Yes, there is plenty of water in flood-time if only it is taken at that time.

No harm to Hay if no water diverted under summer level.

2308. Having seen the cutting proposed and the quantity of water which is likely to be taken down it, if the cutting were governed by sluices under the control of a proper Water Trust, no water being diverted when the Murrumbidgee is below summer level, do you consider that there would be any material harm done to the people down the river? I do not think so, if only they get their proper quantity, but there are a hundred other places in a similar position to the Yanko.

2309. *Mr. Franklin.*] Your comparison of the levels between Hay and Narrandera is taken from the railway levels? As given in the time-table.

Railway station levels and river levels.

2310. You take Hay at (say) 300 feet and Narrandera at a much higher elevation, but is not the railway station at Narrandera a long way above the river level? I should think not more than 50 feet higher.

2311. *Mr. Donkin.*] What is the height of the railway above the river at Hay? About 4 feet above high-water mark.

2312. *Mr. Franklin.*] In considering the difference between Narrandera and Hay, we must consider the difference between the river levels at the two places? Certainly, your engineers can ascertain the levels.

River traffic.

2313. *Mr. Gipps.*] What was the amount of the traffic borne by the river between Hay and Narrandera before the railway was opened, and that which has taken place since? I will supply that information when I return my evidence after revision. (*Appendix* M.)

Objection against erection of a weir.

2314. *President.*] Suppose a weir were constructed across the Murrumbidgee near the cutting into the Yanko to raise the height there, would there be any great objection to that? Yes, very much; those lower down the river would object to it.

2315. On what ground? Because it would turn their water away.

2316. I am supposing that the cutting is protected by sluices and under the control of a proper Trust? I think there would be a great deal of difficulty in deciding the quantity to be sent down.

2317. Suppose that could be satisfactorily arranged, would the interference with the navigation be a matter of great objection? I think so. I think the best plan would be to send down sufficient in flood-time.

Dam across the river at Hay.

2318. *Mr. M'Mordie.*] I think you said that at Hay you put a dam across the river to divert the water for the supply of the town? Yes.

2319. Was objection raised to that? No. We did not put the dam quite across, but only so far as was necessary to make the water run in the direction which enabled us to take what we required.

Navigation.

2320. *Mr. Donkin.*] Does that interfere with navigation? There is no navigation in the summer; it is just about stopping now. I believe there are two steamers between here and Hay, and unless there is another rise, they will be the last this season.

Proposal to divert Snowy River waters.

2321. *President.*] Have you heard of a proposal to divert some of the Snowy River waters into the Murrumbidgee? Yes.

2322. That, I suppose, would be very acceptable? Yes; but I do not think that it would increase the supply at the time when we want it most.

Mr. J. Witcombe. 15 Nov., 1884.

2323. How is it that it increases the volume of the Murray? The Murray keeps up a little longer.
2324. Do you know that there is very little snow-water flows into the Murrumbidgee? Not so much as into the Murray.
2325. If fifty times as much as now flows in were diverted, it would appreciably increase the volume of the Murrumbidgee? Yes.
2326. It would to a great extent make up the deficiency, perhaps more so, by the diversion of water into the Yanko? For a time. Sometimes it happens that the dry season is prolonged to nearly June.

Locking of Murrumbidgee.

2327. Then it would have no effect? No. What we want down below is that the Murrumbidgee should be locked from its mouth, then there would be plenty of water for all.
2328. You would strongly recommend that the river should be locked from its mouth upwards? Yes.
2329. And the water which now runs to waste could be used? Yes.

Diversion of flood-waters only.

2330. *Mr. Franklin.*] Suppose that by the construction of a temporary or movable weir we were to raise the water at summer level for a sufficient time as to send it down the Yanko, would you suffer then? According to the evidence given here to-day that would be no use to them; if you only sent down the flood-waters that would not affect us.

Necessity of dams below Hay.

2331. The inlet is not sufficiently large for a quick discharge out of the river into the creek? There would not be any objection to supplying the creek if the flood-waters were sufficient. If dams were placed below Hay, there would be plenty of water for all. Sometimes the stream is so small that the sheep and cattle and the population at the stations make the water unfit for use for drinking purposes at Hay.

Probable effect of the cutting upon the course of the river.

2332. *President.*] You desire to give some further information as to the probable effect of a cutting upon the course of the river? Yes. Three years ago the river 5 miles below Hay ran round a block containing several hundred acres. Some of the steamers were blocked in the river, and the passage which was made to extricate them was so widened by the river that the water ceased to flow in its old channel, and left a block of land on the other side of it. The land belonged to Mr. Colin Simson, who had to turn it over to the owner of the property on the other side. That shows that any large cutting in the banks may have the effect of diverting the course of the river.

Mr. John Andrew was examined:—

Mr. J. Andrew. 15 Nov., 1884.

2333. *President.*] You reside at Hay? Yes; I have lived in the district over twenty years.
2334. You are the owner of the *Riverine Grazier*? Yes.
2335. You accompanied the Commissioners yesterday to view the proposed cutting into the Yanko? Yes; I came as one of a deputation from the people of the town and district of Hay.

Effect at Hay of the diversion of water into Yanko.

2336. The reason being that it is feared that damage might be done to their interests by diverting a portion of the water from the Murrumbidgee down to the Yanko? Yes; from the scheme as reported to us we felt certain that if it were carried out we should get no water at the time we most needed it. This year the water was flowing by in such small quantity that we had to make a small dam to get water for the town.

Waste of water.

2337. That fear would be removed if the water were never diverted except when there was a large quantity flowing down? There is an abundance of water goes down the river in the course of the year—almost enough to irrigate the district.
2338. *Mr. Franklin.*] And most of it runs to waste? Yes, every year.

Proposal to lock the river.

2339. *President.*] You have heard what Mr. Witcombe has told us about locking the river—do your opinions coincide with his? Thoroughly.

Value of land.

2340. And the water which now runs to waste could be conserved for use if the river were locked? Yes, I believe the value of this Riverine country would be increased twenty-fold. There would be irrigation to supply food for the stock in dry seasons, and the carrying capacity of the land might be increased from one sheep to 5 acres to three or four sheep to 1 acre.

Control of Trust.

2341. Having visited the locality, seen the plans, and heard what has taken place, I ask you if the diversion of water proposed under the control of a properly governed Trust would cause any harm to arise? If the Trust were appointed by people interested all along the river I do not think any harm would arise. If the matter were in the hands of a Department hundreds of miles away I should fear harm would arise. Under a Trust elected by the people interested, water could be dealt out to the Yanko people and anybody else who might require it with very great safety.

Constitution of Trust.

2342. Would you suggest that the Trust should comprise all who are interested in the Murrumbidgee and the Yanko combined? I think it should include all who are interested in the different effluents of the Murrumbidgee.
2343. Would it not be well to make a number of small Trusts? In actual practice it might be so, but it does not strike me that that would be the better course at first. If there were several Trusts over one river their various rights would have to be defined by statute, whereas if there were a general Trust over the whole river there would be no clashing of interests, and less legislation would be required.
2344. The Trust should not comprise people who lived at such a distance from the watercourses that they could receive no benefit? No—only of people who were interested. There should be a small tax upon the land, and all who paid rates should have a right to vote for a body which would be something analogous to a District Municipal Council.
2345. And the works should be undertaken by that body? Yes.
2346. Would you give them power to borrow money? Yes; and to levy tonnage dues on vessels going up and down the river.

Diversion of snow-waters into Murrumbidgee.

2347. You have heard of the proposal to bring some of the snow-waters into the Murrumbidgee? A very good thing it would be. At Deniliquin, where I lived for some years, the snow-waters usually came down in October, but we do not find that they make much difference to the Murrumbidgee. The snow-water always came down perfectly clear, and there were little bubbles on the surface of the stream. When the winter has been severe and the fall of snow heavy we have had the snow-water down the Murrumbidgee, but the occurrences have been few and far between.

Supply at Hay.

2348. Would the additional volume of the river from the snow-water remove the fears entertained of diminishing the supply at Hay? It would be very desirable if the snow-water which now runs to waste could be diverted into the Murrumbidgee.

The Hay water supply.

2349. The people of Hay have carried out a scheme for supplying water to the town? They have.

Mr. J. Andrew. 15 Nov., 1884.

2350. Is the supply used to any great extent to irrigate paddocks and gardens? The water is raised a height of 50 feet, and the cost of raising it is greater than can be paid for ordinary purposes of irrigation. The Chinese gardeners grumbled at having to pay the amount charged per annum. The cost of raising the water 50 feet high is 11d. per 1,000 gallons. Our surveyor calculated that they were not paying more than 3d. per 1,000 gallons, and when we placed meters to govern their supply they would not pay the cost. Nearly every house irrigates to a small extent, and now there are beautiful gardens full of flowers where before nothing would grow. The streets were planted about the same time, and now some of the trees have made so much growth that 100 men could stand in the shade of a single tree.
2351. It is only a matter of percentage as to whether you apply it to agriculture? That is all.
2352. Have you any idea what your water scheme cost? About £5,000, and we have spent £2,000 more lately. We also want to lay down larger pipes. Cost.
2353. The water is pumped from the Murrumbidgee? Yes.
2354. Does the quantity withdrawn affect the Murrumbidgee in dry times? It nearly all runs back again into the river. Effect on Murrumbidgee.
2355. The consumption for domestic purposes and for irrigation would not all go back? A great deal percolates through the soil.
2356. Have you any idea how much you pump per day or week? I will obtain the figures from the Mayor and return them with my evidence. (*Appendix* N 1.) I have heard several questions about summer level. The term is indefinite, and indicates different levels at different places. At Hay, however, it has a definite meaning, for when the bridge was built a gauge was put on, and summer level is there a fixed point. Quantity pumped per day.
2357. What is that point? About 24 feet below the highest flood. Summer level at Hay.
2358. Have you any records of the height of the river which would be of service to the Commission? The record has been taken twice a week and can be compiled from the newspapers, in which they have been published for the last ten years. I will supply the information. (*Appendix* N 2.) Some question has arisen as to the rise in the river. I have noticed that while the river is confined within the low banks the rise may be very rapid, but after it overflows it does not rise beyond an inch an hour; and when it overflows the high banks it does not rise one inch in twenty-four hours. A rise at Wagga usually takes three weeks to come to us. Records of height of river.
2359. Does the water lose much in volume between Wagga and Hay? It takes a considerable rise at Wagga to make any rise at Hay. Loss of water.
2360. Do you think that much is lost by soakage? There may possibly be a loss by soakage; it is very likely that there is some drift from the bed of the river. Soakage.
2361. *Mr. Franklin.*] Are you aware of any point where there is a high flood level within the banks marked for gauge purposes? On the bridge. I desire to say that the rise from Wagga takes ten days to come to Hay. Flood level mark. Velocity.
2362. Are you aware that there is any point nearer Hay where a high flood is kept within the banks which would be available for measuring purposes? There is a point near my house where the water comes up to the bank and does not overflow, but then there is a low bank on the opposite side. I do not know of any such point as you describe suitable for measurement. When there is any high flood it makes a perfect sea for miles out. Flood level mark nearer Hay.
2363. Do you know the velocity of the river when it is at a low level? No, but I have known it so low that you had to look closely to see it trickle over the sand. Velocity at low level.
2364. Even though it is confined to a narrow channel? Yes; it has seemed to me as if all the water brought down could then be carried through a 12-inch pipe without any rapid flow.

SATURDAY, 15 *NOVEMBER*, 1884.

At Jerilderie.

Present:—

MR. BARTON, M.P.,
MR. DONKIN, J.P.,
MR. FRANKLIN, C.E.,
MR. GIPPS, C.E.,
MR. LYNE, M.P.,
MR. MURRAY, M.P.,
MR. M'MORDIE, B.E.

R. BARTON, ESQ., M.P., IN THE CHAIR.

Mr. Evan Jones, selector, called in and examined :—

Mr. Evan Jones. 15 Nov., 1884.

2365. *Chairman.*] Where do you reside? On the Yanko Creek.
2366. Can you give us any evidence with respect to the Yanko Creek? About thirteen months ago I and two others were sent by the Yanko residents to see if there was any obstruction in the creek which prevented the water from coming to us. We followed the creek right up but we found no material obstruction. There seemed to be a great insufficiency of water. There has not been any running water in Yanko Creek, where I reside, for four years.
2367. On what part of the creek do you reside? In the middle of Sir Samuel Wilson's Yanko Station; about 2 miles from the Wilson Post Office, and about 60 miles below the junction of the Yanko Creek and the Murrumbidgee. The Yanko Creek has not run into the Billabong since I have been in New South Wales—that is ten years. Since the creek has been dry the rainfall has been diminished by at least one half, and the value of the Yanko land has been reduced by one half in consequence. Yanko Creek. Rainfall.
2368. From what you saw when you went up the creek, do you think that by widening the cutting or straightening the creek you could get a sufficient supply of water? I was very much disappointed when I saw the cutting, considering that such a large amount of money has been spent on it. The only means by which we can get water is by deepening the cutting 3 feet, widening it 8 feet, and removing the roots and snags. Deepening of the cutting.
2369. At what level do you think the water ought to be taken from the river? Three feet below the bottom of the present cutting. There was very little water in the cutting when I was there, notwithstanding that there was a good stream in the river. Diversion level.

2370.

Mr. Evan Jones. 15 Nov., 1884.

2370. Suppose that the cutting were made 10 feet or 11 feet wide, would that be sufficient to allow the water to run through when there was an ordinary rise in the river? It would, but there must be a flush in the river to force the water down so far as to the place where I live.

Water supply once a year.

2371. Would the wants of the people in the lower parts of the creek be fairly well supplied if the water were run through once in every season? Yes, that would be satisfactory—no one would have any cause to cry out for want of water. If a good supply were run through once a year the creek would retain a sufficient quantity for the rest of the season. I have no hesitation in saying that, because I know that the holes in the creek will hold water for nine months at a time.

Value of land.

2372. Would the value of the land be materially enhanced if you got such a supply of water? Unquestionably so.

2373. What is the value of the land which you occupy? Three years ago it was worth £2 an acre, but now I could not get 25s. for it—no one would buy it. It would be double its present value if we had a regular supply of water.

Irrigation.

2374. Do you think that many people would use the water for irrigation? Some might, but I do not think that the majority would. All the selections have very narrow frontages to the creek, and by cutting up the frontages for the purpose of irrigation we should deprive the stock of access to the creek, because any roads which might be formed would be so narrow that they would soon be entirely destroyed by the sheep traffic.

Payment of interest.

2375. Do you think the selectors would be willing to pay their share of the interest on the cost of making provision for a regular supply of water? I have not heard any one raise any objection to the proposal when it has been mooted. The amount which we should have to pay would be very slight compared with the great advantage which we should derive. I have spent more money to provide means for raising water from the creek to keep my stock supplied than would pay my share of the cost of the cutting twice over. I do not think that there would be a murmur from any one against a rate to pay the interest on the cost of the work.

Local Water Trust

2376. Would you be in favour of the constitution of a local Water Trust to carry out the works and to regulate the supply of water? Decidedly.

Execution of work.

2377. Would you be in favour of the work being done by a Trust or by the Government? It would not matter to us by whom it was done.

2378. Do you not think that a local Trust would carry out the work more economically and effectually than the Government would be likely to do? I have no doubt that it would, because I am aware that there are men in our locality who would be prepared to undertake to do the work at once, and who would do it in much less time than the Government.

Dams.

2379. You are aware that there are a number of dams on the Yanko Creek? Yes.

2380. Do you think that it is necessary to dam the creek to ensure a supply of water? I should say nothing against dams as long as they were constructed so as not to throw the water over the banks of the creeks. All dams should be overshot dams. The Coree dam threw the water over the flats, where it was of no use to any one. The country is not very well adapted for the construction of overshot dams. Ordinary dams with proper by-washes leading into the creek would be the least expensive, and I do not think that any one would object to them. There is not a man on the creek who would object to dams if properly constructed. We do not wish to see the water go to waste. A dam 3 feet 6 inches high will throw the water back 3½ miles. The more water is conserved in the creek the more rain we shall get.

Diversion into other creeks.

2381. Are there any other creeks into which it would be advisable to divert the water? The water will run from the Yanko into the Billabong, supposing that the stream is sufficient to fill the dams above that point.

Wells.

2382. Have you had any experience in well-sinking in the district? I have sunk seven wells on my property.

Quality of water.

2383. With what result? I have obtained fresh water in three, and hard and sweet water in the others, but the water in all can be used even for domestic purposes.

Depth to water.

2384. At what depth did you get the water? From 60 to 97 feet.

2385. Is there any difference in the rise of the ground between the wells where you strike water at 60 feet and at 97 feet? In the deeper wells I think we strike the water at a lower level, as it rises 30 feet when we strike it. It does not rise to that height in the shallow wells. We prefer to strike the water at from 80 to 90 feet, and if the wells are properly slabbed we can hardly exhaust the supply when we get water at that depth.

Supply from deep wells.

2386. Then you have an unlimited supply in the deep wells? Yes. It would be impossible to sink the wells any deeper, as the flow of water is too great.

Nature of strata.

2387. What is the nature of the strata? There is no rock—it is all alluvial deposit. The first 20 feet is through whitish clay; then there are from 15 to 20 feet of a sort of burnt clay; then there is a bed of gravel; then a bed of sand as fine as dust; then there is another bed of clay, and after this another bed of coarse gravel. This bed varies from 15 feet to 30 feet in depth. If we get this bed 30 feet in depth we know that we are sure to get a good supply of water in the bed of fine gravel underneath.

Fossils.

2388. Have you ever found any petrified wood or shells in the drift? We have found pieces of partly decayed wood, and I have found roots which appear to me to be the roots of ferns. We have found shells like cockle shells, only larger. I believe that they are marine shells.

Overflow from Cudal Creek.

2389. *Mr. Gipps.*] What was the height of the river when the Yanko Creek flowed into the Billabong? I do not think the water came down the Yanko cutting—I think it was an overflow from the Cudal Creek, which ran a banker. The race ought to have been made into the Cudal Creek, in which there is a good fall.

2390. From what source does the Cudal Creek derive its supply? From the flood-waters of the Murrumbidgee.

Diversion o flood-water into Cudal Creek.

2391. Suppose the flood-waters were directed into the Cudal Creek, would you get it quicker than through the Yanko cutting? Yes, fifty to one. There is a fall all the way in Cudal Creek, whereas there is very little fall in the Yanko. To be of any use the Yanko cutting ought to be deepened 3 feet, and ought to commence 3 miles further up the river.

Swamps.

2392. Are there any large depressions in the Cudal Creek country in which water might be stored? I do not think so; there are some swamps at the top of the creek, but they are very shallow.

Nature of strata.

2393. Have you any idea as to the nature of the strata below the bottom of the well to which you have referred? No, because we could not get through the sand drift in which we found the water.

Cost of sinking wells.

2394. What was the cost of sinking the wells? We did the work ourselves, but I would not undertake to

to sink a well and provide the timber for less than from 30s. to 35s. a foot. We have to get the timber from Narrandera and Deniliquin. Mr. Evan Jones. 15 Nov., 1884.

2395. What is the ordinary level of the water in the wells? In the deepest well the water is 30 feet high. The level in all the wells is about the same. The well from which I am pumping now is within 4 feet of what it used to be when there was water in the creek. I think that these wells are supplied by an undercurrent from the Murrumbidgee. The undercurrent of the Yanko Creek has been of more value to us than the surface water for the last four years. Level in wells.

Mr. Michael Curtin called in and examined:—

2396. *Chairman.*] Where do you reside? At Jerilderie. Mr. M. Curtin. 15 Nov., 1884.

2397. Can you give us any information with reference to the Yanko Creek? I have known the creek for twenty years; for the last five or six years there has scarcely been any running water in it at all.

2398. Can you give us any information in reference to the Billabong? I know that the bed of the Billabong is filling up year by year. Billabong.

2399. Have you ever heard the selectors on the creek complain of the want of running water? Yes, there is a general complaint from them. Want of running water.

2400. Do you think that, if the Government were to carry out works which would ensure a regular supply of water in the creek, the residents would be prepared to pay a rate equal to the interest on the money spent? From remarks which I have heard them make I should think so; I have heard several express themselves in favour of paying such a rate. Payment of water rate.

2401. Would you be in favour of a local Trust being empowered to carry out the work? Yes, I think the work would be better done by a Trust than by the Government, because the local people know the country very well. Local Trust.

2402. Does the Yanko Creek discharge into the Billabong? Yes, about 25 miles from here. Junction of Yanko and Billabong.

2403. Has the water ever run right through into the Billabong from the Yanko? Yes, several times.

2404. Do you know where the outlet of the Billabong is? Yes; it discharges into the Edwards, near Moulamein, but the Billabong is gradually filling up—there is not sufficient water to carry the silt away. Outlet of Billabong.

2405. Is there very much water in the Billabong at the present time? Very little—it is a chain of water-holes. It was the same last year. The water has not run through at all this season. Water in Billabong.

2406. *Mr. Gipps.*] Supposing a good supply of water were run into the Billabong, what number of people would be benefited by it? I suppose that the water would go all the way to Moulamein, therefore the people all the way down would be benefited. There are selectors all the way along the Billabong. Supply of water in Billabong.

2407. Do you think that if the water were diverted from the Murray into the Billabong it would be of any service to the settlers? I think that it would be better to divert the water from the Murrumbidgee, because then the selectors on the Colombo would get the benefit of it. Diversion from the Murray.

2408. From what source does Jerilderie derive its water supply? From the Billabong Creek. Sometimes the water comes from the Murrumbidgee into the Colombo and into the Billabong. There has been very little water in the township during the last two or three years. There are two dams near the township in which there is no water now. We have to cart water about 2 or 3 miles from a water-hole, in which very often there are dead horses and cattle. Jerilderie water supply. Carting water.

2409. Is not the health of the population affected by the use of such water? Such does not seem to be the case; but the majority of the people have underground tanks, from which they get a supply of water for domestic purposes. Poor people who have not tanks have to use the water from the creek. Underground tanks.

2410. At what height would the Yanko Creek have to run before it would flow into the Billabong? I do not think the water has flowed into the Billabong from the Yanko for years—it has been kept back by the dams. To flow over the dams the water would have to be 20 feet high. The dams throw the water back into blind creeks. The water must run clean over the dams before the people below can get it. Water from Yanko running into Billabong.

2411. *Mr. M'Mordie.*] Are the dams so high that they throw the water over the banks? I think so. I know that the settlers on the frontage of the Yanko have not had a drop of water this year. Dams.

2412. Is there any supply of water coming down the Billabong Creek from its own head? Sometimes, but for two or three years it has not come down; it did not come down last year; I think it is at least two or three years since it came down. Billabong head waters.

2413. Was there any considerable supply when the water came down last time? There was, but we had no dams here to intercept it. Last water supply.

2414. Does the water flow in the Billabong for any length of time? In dry seasons it does not, but I have known it to flow continuously for twelve months. Intermittent flow in Billabong.

Mr. Matthew L. Ashe, Manager of the Bank of New South Wales, Jerilderie, called in and examined:—

2415. *Chairman.*] Have you resided here for any length of time? About three years. Mr. M. L. Ashe. 15 Nov., 1884.

2416. What opportunities have you had for gaining information on the question of bringing water by the Yanko Creek? All that I know about it I have gained from the residents on the creeks. From what I have heard, I have no doubt that the proposed cutting would do an immense amount of good; I believe, from what I have been told, that it would give a supply of water through the Yanko and Colombo to the Billabong, and that embraces a considerable extent of country.

2417. Suppose the proposed work were carried out, do you think the people residing on the creeks would offer any objection to the payment of a rate sufficient to cover the interest on the expenditure? I do not think so. Payment of water rate.

2418. Do you think it would be advisable to entrust the work to a local body? The question of a Trust has not been mooted here, but I believe that if a Trust were appointed, the work would be done satisfactorily. Local Trust.

2419. Do you know anything about the dams on the creeks preventing the water from coming down? I have heard that the dams on the Yarrabee Station prevent the water from coming down, but I have not seen these dams. Dams.

2420. Do you not think it would be advisable to appoint a Trust to regulate the supply of water, so as to prevent one man from getting more than his fair share of water? The difficulty would be to get disinterested and practical men. If the Government undertook to regulate the supply, they would no doubt send practical and disinterested men. Supply of water regulated by Trust.

Mr. M. L. Ashe. 15 Nov., 1884.

2421. Have you had any experience of Water Trusts elsewhere? When I was in Mansfield, in Victoria, there was an agitation for the formation of a Water Trust there. I am aware that Trusts have been formed in Victoria, and it is said that they have done good work. The only difficulty about the formation of Trusts is, that you may not always get disinterested men. If we had a municipality here, that difficulty would be overcome to a certain extent.

Trusts in Victoria.

Run of water in Billabong.

2422. Do you know how often the Billabong runs? I have been given to understand that it has run through every year during the last ten years; I know that it has run through during the last two years.

2423. Did it run through last year? Yes.

2424. From what source? I believe from its head, and not from the Yanko.

2425. You are quite sure that the Billabong ran through Jerilderie last year? Yes; I suppose it was 10 feet deep opposite the township last year, but that was only for a few days.

Dams on Billabong.

2426. Are there any dams on the Billabong which conserve the water? Yes, and they were filled last year. The Coree dam was cut away by the people residing below it.

Destruction of dams.

2427. *Mr. Donkin.*] Do you think it likely that the people will cut away the dams which have been constructed for the supply of the township? I have been given to understand that it would not be lawful for the people to cut the dams, as they are not above summer level.

2428. Why did the people cut the Coree dam? They said that it threw the water out of the creek into another creek 4 or 5 miles away. I do not think that any objection would be offered by any one to the construction of overshot dams on the creek.

Supply of Billabong from Murray.

2429. *Mr. M'Mordie.*] Do not you think that a better supply could be got into the Billabong Creek from the Murray than from the Murrumbidgee? I do not see how you can get any connection between the Billabong and the Murray. If there is a sufficient supply in the Murrumbidgee I should decidedly think that it would be better to get the water from that river, but I have never heard any one suggest that the water of the Murray should be diverted into the Billabong.

Wool-washing.

2430. *Mr. Gipps.*] Is any wool-washing done on the banks of the Billabong? Yes, in the tributaries, but not on the main channel.

Natural supply of Billabong.

2431. *Mr. Murray.*] In an ordinarily good season the Billabong would be supplied from its natural source, without any water coming in from the Yanko? Yes, but only for a short time; it would perhaps run for four weeks during the year.

Ordinary flood-level.

2432. *Mr. Franklin.*] What is the ordinary flood-level—is it higher than the overshot dams near the township? Yes.

Length of Billabong.

2433. What is the length of the Billabong from here to its outlet? About 200 miles.

Floods.

2434. Are the floods continuous? No; the water runs away very quickly. I have seen the water over the fence close to the bridge, and the next morning it would be below it; perhaps on the following day it would be gone altogether.

Overshot dams.

2435. If there were a series of overshot dams on the creek, would they conserve a permanent supply of water? Yes.

2436. *Mr. M'Mordie.*] There would be no use in sending a supply from the Murrumbidgee once or twice a year? Only in the event of dams being constructed, because the creek dries up very rapidly.

Mr. James D. Rankin, auctioneer, Jerilderie, called in and examined:—

Mr. J. D. Rankin. 15 Nov., 1884.

2437. *Chairman.*] Have you been long in the district? About eight years.

2438. Do you know how often the water from the Yanko has run through into the Billabong? It has not run through since 1879—then the Yanko was running a banker.

Yanko and Billabong Creeks.

2439. What do you think is the reason of the water not running through more frequently? I think it is caused by the dams on the upper part of the Yanko. If the flood from the Murrumbidgee into the Yanko is not continuous the dams intercept the water, and then when the river subsides, a large quantity of the water flows back into it. I have been told that some of the dams are as high as from 15 feet to 18 feet. The water must have been thrown over the banks of the Yanko in the last flood. I am decidedly of opinion that all the dams should be overshot dams.

Dams.

Water rate.

2440. Do you think that the people on the creek would be willing to pay a rate equal to the interest on the cost of a work which would provide them with a supply of water once or twice a year? From what I have heard, I do not think they would offer the least objection to it.

Irrigation.

2441. Do you think that if there were a constant supply of water in the Yanko and Colombo Creeks irrigation would be carried on to any extent? The only person I have heard talk about irrigating is Mr. Killen, and I have no doubt that if one man were to do it, and the work were successful, others would follow his example.

Flow in the Billabong.

2442. Has the Billabong run through once a year during the last ten years? Yes, until this year.

Better supply in Billabong.

2443. Can you suggest any means by which a better supply of water could be obtained on the Billabong? I think that if there were a good supply on the Colombo and Yanko Creeks, a good supply in the Billabong would be ensured.

Dams.

2444. Are there any extensive dams on the Billabong which divert the water on to the plains? There may be one or two. There are a few below here, about which the people have been complaining.

Wells.

2445. Have you had any experience of well-sinking in the district? I know that a large number of wells have been sunk, varying in depth from 40 to 120 feet, and that in all cases water has been obtained.

Water-level in wells.

2446. Do you know whether the water in the wells rises to any particular level? I do not think there is any uniform level. The supply in the wells varies; there is a well at the railway station, the depth of which is 105 feet. There is about 8 feet of water in it.

Supply in wells.

2447. Generally speaking, is there a good supply of water in the wells? There is. It is a very rare thing to hear of a well being sunk without water being obtained on these plains.

Supply of the Billabong in 1879.

2448. *Mr. Murray.*] Did the bulk of the supply in the Billabong in 1879 come from the Yanko and Colombo Creeks, or from the natural source of the Billabong? It was a wet season generally, and a good deal of the water must have come from the Colombo and Yanko Creeks, as they were both running.

Mr. J. D. Rankin. 15 Nov., 1884.

2449. Do you think that any water came from these creeks into the Billabong last year? No, I think not. I believe there was an exceptionally heavy fall of rain near the source of the Billabong, and that the water which we had came from that source. Source of the Billabong.

2450. Do you know of any feasible plan of diverting the Murray waters into the Billabong? It might be done by canal, as I believe that the level of the Billabong is considerably below that of the Murray. Diversion of Murray waters.

Mr. Edward Killen, grazier, called in and examined:—

Mr. E. Killen. 15 Nov., 1884.

2451. *Chairman.*] Have you had any lengthened experience in the Jerilderie district? I have been here about nine years.

2452. Can you give us any information as to the time which it takes, under different circumstances, for the creeks to flow through at the present time? No.

2453. Can you suggest any means by which the rapidity of the flow in the creeks can be accelerated? If the Yanko Creek were cleared of snags, and the cutting into the Murrumbidgee made sufficiently large, I have no doubt that the flow of water would be increased. Acceleration of flow in the creeks.

2454. Do you think that it would be sufficient for the requirements of the people on the creeks if water were run through once a year for certain? Yes; I think that it would give them a supply from one year to another; it would supply the pressing wants of stock, but would not admit of irrigation being done. Frequency of supply.

2455. Do you think that if the Yanko were to run through whenever there was a rise above 5 or 6 feet in the Murrumbidgee that irrigation would be carried on to any considerable extent? I think that irrigation would be carried on to a considerable extent on the Yanko and the Billabong if there were sufficient water. Irrigation.

2456. Do you think that, in that case, the people who availed themselves of the advantage would be prepared to pay a rate which would cover the interest on the outlay? I think that they would, but I have no doubt that a great number would hold the opinion which I do,—that as the Government have received such a large amount of revenue from the sale of lands here, they ought to make provision for the supply of water to us. The expenditure would be small in comparison with the land revenue which the Government have derived from the district. At the same time I believe that the people would pay a fair rate rather than be in want of water. I think that it would be unreasonable for the Government to ask for a rate under the circumstances. The expenditure of the paltry sum of £7,000 or £8,000 would do all that we want to have done. Water rate. Water supply secured by Government.

2457. Can you give us any idea as to the amount of irrigation which would be done? No; I had intended to irrigate from 50 to 100 acres myself, but I would not undertake to do so with the uncertain supply of water which we have at present. Irrigation.

2458. Can you tell us how often the Billabong has run through here? I live on the banks of it, and I know that it has run through every year until this year. Supply in the Billabong.

2459. But we have been told in evidence that it did not run through last year? I know that it ran through here for at least six weeks last year.

2460. Do you think that the dams in any of the creeks are a hindrance to the water running through? I do not think that they are. I have not seen the Yarrabee dams, and it is quite possible that they throw back into the Murrumbidgee water which would come here if it had a free flow. Effect of dams.

2461. You have no objection to overshot dams being constructed? No man of common sense would object to them. Overshot dams.

2462. Do you think that a series of dams on the creeks would conserve a large quantity of water, which would benefit the district and affect the climate? It would be an immense benefit to the district, and I believe that it would affect the rainfall to a slight degree. Conservation by series of dams.

2463. *Mr. Gipps.*] Do not you think that it would be advisable to have sluice-gates in the dams, in order to allow the dams furthest from the source to be filled first and so on to the source? I think that that is a good idea, but it would be attended with considerable expense. It would prevent grumbling on the part of the people on the lower parts of the creeks, and it would prevent the water from returning to the river. Sluice-gates.

2464. Do you know of any springs in the district? No.

2465. Do you think that the necessary works would be carried out better by a local Trust than by the Government? I should be in favour of the Government doing the work. Trust.

2466. *Mr. Franklin.*] Are there many people who would be benefited by the improvement of the Yanko inlet? There are a large number of residents on the Yanko and the Billabong. Yanko inlet improvement.

2467. What makes you think that the necessary works may be constructed for £7,000 or £8,000? I have been told that amount would make the proposed cutting.

2468. As this is only a small portion of the Colony in which such works are needed, what real excuse is there for the people not paying a reasonable rate—such a rate as would cover the interest on the cost of the work? I do not think any one would object to doing so—I believe that all the landowners on the creeks would willingly pay a portion of the expense. Water rate.

2469. You must bear in mind that, according to your estimate of the cost of the work, £300 a year would pay the interest? I raise no objection as to the amount. My contention is that, as the Government have derived such a large amount of revenue from the sale of land in the district, they ought to bear the whole of the expense. Revenue from land sale.

2470. *Mr. Murray.*] Although you are in favour of the work being done by the Government, do not you think that it would be a good thing to appoint local Trusts to regulate the supply of water? I dare say that it would be. Local Trusts.

2471. Whence do you derive your supply of water? Principally from the Billabong. There has been a dam at my place for eight years; there has always been plenty of water in it, and no attempt has been made to cut it away. Supply of water from Billabong.

2472. From what source do the majority of the people derive their supply of water? From holes in the creeks.

2473. Has there been any loss of stock on the Billabong this season? Stock will bog in some places in the creek at the present time, and we are all shifting the stock for want of grass as well as of water. Loss of stock.

THURSDAY,

THURSDAY, 20 *NOVEMBER*, 1884.

At Sydney.

Present:—

MR. BARTON, M.P., | MR. GIPPS, C.E.,
MR. DONKIN, J.P., | MR. LYNE, M.P.,
MR. FRANKLIN, C.E., | MR. MURRAY, M.P.,
MR. M'MORDIE, B.E.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. W. B. Henderson further examined:—

Mr. W. B. Henderson. 20 Nov., 1884.

2474. *President.*] What is the name of the other well to which you referred in your last evidence? Bore D, 7 miles beyond the Goonery well.

2475. What further information have you obtained since you last gave evidence? I have struck water in another bore.

Water in a bore.

2476. In that particular bore? No, we have been stopped on that line, owing to the drought.

2477. Did you go on sinking after you had got water? Not far—the rock was too dense for steel cutters.

Quantity of water.

2478. What quantity of water did you get? 4,320 gallons a day.

2479. Can they raise that to the surface? It is flowing over the surface.

2480. Then why should there be any want of water? I refer to that line further ahead.

2481. You are not going further? No; but I believe we shall get an immense supply in that well. The object for which we started has been attained.

Section.

2482. Have you a section of that well here? I have.

Well beyond Goonery.

2483. Can you give the Commission any further information about the well 7 miles beyond the Goonery? The only information I can give is that we have gauged the water, and the quantity obtained is 4,320 gallons a day, flowing 3 feet over the surface. It has been flowing for some time. This is the last water from the lowest level.

2484. And have you given up sinking in that well, or are you going further? We have given up for the present. I was thinking of recommending a diamond drill there, as the rock is hard.

Nature of rock.

2485. Do you know the nature of the rock? Yes, it is cretaceous mud rock.

Tank.

2486. Are you sinking further out? No. We went out and made a tank, and had to have water carted to it a distance of 18 miles. The tank was intended for the domestic use of the party. Since we made the tank there has been no rain to run into it, and we have had to give up.

Cased bore.

2487. *Mr. Franklin.*] Is that an open bore or a cased one? It is cased for some 357 feet.

Carrying of water.

2488. *Mr. Barton.*] What was the object of sinking so near, instead of going further into the Goonery Plains? It was considered that we should not be able to carry water further; the road is very heavy. We had a team of eight horses, and it was found they would not be able to carry the water much further. The original intention was to go 15 miles away. An inspector was sent out, and he thought that the distance would be 10 miles, instead of only 7 miles. It would take two other points between Bore D and the Paroo to open up the road. I got a telegram recently to say that some rain had fallen towards the 75-mile site. It is the intention to put bores down at the 75 and 95-mile posts, should rain come to admit work, and so open this route.

Wells about Walgett.

2489. *President.*] Are you continuing to sink wells in any other places? Yes, about 40 miles from Walgett is one point.

2490. Since you last gave evidence have you struck any fresh water near Walgett? Yes.

Position.

2491. Describe the position? It is about 5 miles from the former bore.

2492. North, south, east, or west? West.

2493. Can you point it out on the map? No; the owner of the station has promised to get me information as to the exact spot.

2494. What is the object of sinking for water in that neighbourhood? There is not a drop of fresh water near there.

Payment for use of machine.

2495. At whose instance is it done? That of Mr. Capel, the squatter who owns the station. He pays the Department so much a week for the use of the machine.

2496. Under your guidance? Yes, the Department sends out a machine and one man in charge. The hirer pays for use of machine and finds the other labour required.

2497. It is not a stock route? No.

Supply.

2498. What is the supply of water in that well? They cannot gauge the supply with available appliances, as after they lower the water to a certain depth it stands at one level.

2499. Is it an artesian well? No, it rises to within 78 feet of the surface.

Salt water.

2500. Did you strike any water above that? Yes, salt water.

Depth from surface.

2501. At what distance from the surface? Between 70 and 80 feet, then at 30 feet below that, and again at about a depth of 180.

Salt water.

2502. Is this a tube well? Yes. We have also struck an immense supply of salt water between Callarandrie and Angledool since my last examination.

2503. You say this is salt water? Yes.

Depth.

2504. At what depth? We have struck a very strong supply at a depth of 166 feet.

2505. Is that in a tube well? Yes.

Rise.

2506. Does it rise to the surface? No; it rises close to the surface.

2507. Do I understand you to say that it is so salt that it cannot be used for stock? It is as salt as the sea.

Crust of cemented gravel.

2508. *Mr. Barton.*] Is it your intention to go through it? Yes; they are on a very hard crust of cemented gravel at present.

Nature of country.

2509. *President.*] What is the nature of the country where you found the water? I do not think it is cretaceous.

Water-worn gravel.

2510. Is it drift? It is gravel, drift, and clays. I think there is fresh water underneath. The gravel there is more water-worn than in the borings west of Bourke.

Wells between Wilcannia and Silverton.

2511. Are those the only two wells that you have any further information about? We are sinking between Wilcannia and Silverton, and since I was here last they have struck brackish water. On going a little deeper the water is found to improve slightly. A great deal of limestone is met with. This point is between Wilcannia and Silverton, about 20 miles west of Wilcannia.

2512.

Mr. W. B. Henderson.

20 Nov., 1884.

2512. Do you find as a rule that, throughout New South Wales where you have been sinking, you strike salt water above the fresh? Yes.

2513. Then the supply of fresh water that you strike below the salt water is in most cases artesian? Yes. One thing noticeable about it is that each stratum of water struck has its own particular level. If we strike the water (say) at 80 feet in a well it rises to a certain point; if we strike water in another stratum below that, it does not rise to the same point. Fresh artesian water below salt water.

2514. Then each water is distinct from the other? Generally. With very few exceptions I find that each layer has its distinct point of level. Sometimes it does not rise so high as the water struck above it. As a rule, the deeper the water is struck the higher it rises. Distinct point of level of water strata.

2515. Have you any further information that you particularly desire to give to the Commission? None except as to the supply of water which I have observed in the high lands. When connected with mining I used to pay particular attention to it all over the Colonies. I have taken notes of my observations for over twenty years. Supply of water in the high lands.

2516. What observations have you made? In working the mines on the old basaltic formation in the Colonies I have found in several instances the water so strong in those old river-beds that there was no chance of overcoming it except by tunnelling. In instances I have followed the water down from 100 feet to 200 feet under existing watercourses. Water in old river-beds in the basaltic formation.

2517. What deduction do you make from that? That these are old river-beds starting all along the dividing range, covered by basalt, and once they take a trend out to the west they are gorged with an almost unlimited supply of water, and are covered over with this formation much deeper than the present rivers and creeks. Unlimited supply.

2518. Can you give us any information as to these cases? Yes, there is one case at Tumberumba where the basalt crops out covering a defined lead commencing at a point known as Surface Hill. Out-crop of basalt at Tumberumba.

2519. From towards Adelong? Yes. I was superintending workings there ten years ago, and followed that lead down towards and below Tumberumba. A tunnel was put in above Tumberumba to tap the lead from the level of the existing creek. Some tunnels were also put in below Tumberumba. The tunnel furthermost up the creek referred to, after being down some 200 feet, came on the lignite, dipping at an angle of 40 degrees into the hill directly under the run of basalt, which run averaged about 300 feet in width. The water tapped here below the lignite was so strong that it was considered impossible to follow the dip downward even with powerful machinery, so the work was abandoned. The tunnels below the township, from level of existing creek, came on the lignite fast dipping, water also strong—too strong to follow downwards. The water continued to flow from the tunnel deepest tapped strong and steadily, and was so years after, on my last seeing it, without any apparent diminution. Water tapped below the lignite.

2520. That was where you found the lignite? Yes, under it the water flows strongest.

2521. How far is that from the Tumberumba township? The tunnel referred to is about 1½ mile.

2522. Up the creek? Yes.

2523. Does the water come out of that tunnel into the creek? Yes. I traced this lead down below Tumberumba.

2524. Still in the hill? Yes. The existing creek crosses the basalt, and it is on the top of the basalt. A little further on it trends towards the Murray, and disappears altogether. There is a dip of 350 feet in about 10 miles. Creek on top of basalt.

2525. Where you lose the basalt you lose also this flow of water? The present creek is on the top of the basalt, some distance below Tumberumba. Further down the basalt is covered out of view.

2526. You struck the water below the lignite above Tumberumba? Yes. Water below the lignite.

2527. You also struck it below the lignite in the same formation below Tumberumba? No, I was above the lignite there. I proved further down the creek the dip of the basalt.

2528. But you could prove the water? The water lodges under the lignite all the time. The lignite follows the old creek or river-bed, and is bound to be full of water. Old river-bed.

2529. You struck the water above Tumberumba in a certain formation—you also struck that formation below Tumberumba? Yes, the top of it.

2530. Is there water below that? Yes.

2531. This formation dips under the Tumberumba Creek; or rather, the creek goes through a gap? Yes. Dip of formation.

2532. And dips so rapidly that you lose it entirely in its course towards the Murray? Yes.

2533. Your theory is that that formation still continues? Yes.

2534. And the lignite also? Yes.

2535. But this underground watercourse is tending towards the centre of the Colony? I thought, in following it first, that it was tending due east, and I followed it down, but I found that it turned right round to the south, then to the south-west. Direction of the old river-beds.

2536. That is towards the centre of the Colony? Yes. I could give ten or twelve cases, and in every case these old river-beds trend westward. In examining the Bingera district some six weeks ago I had occasion to examine one of these old river-beds, basalt-capped, containing diamond-bearing drifts under the basalt. I crossed it at different points extending over 30 miles in length. Old river-bed in Bingera district.

2537. What width is it? From a quarter of a mile—even less in some places—to, at the most, 1½ mile; that is the outside—the lip, but I should think that the centre or deepest part would be about 300 yards. Width.

I took the measure from Bingera of the present river-bed, the Gwydir, a very big river. By aneroid measurement, from the top of the basalt lead nearly opposite Bingera, I found that the height was 1,010 feet over the Gwydir. That is the highest basaltic peak. It goes due west, and disappears under the said river, being lost sight of altogether. The diamond drift is comparatively high up in the range. I followed the line of basalt down, and found one shaft sunk over 200 feet, being considerably under the deepest level of the existing creek. At this point the dip of rock from bottom of shaft trended still deeper. Water was met with, and work was suspended. Lignite was passed through in sinking. A miner named Cross put down the shaft and supplied me with the information. I observed that the wash obtained from bottom of shaft was highly water-worn. That is a proof that the old river-bed exists under the existing creek course in that instance. A few days after I inspected another basalt lead, about 10 miles to the west of Bingera. The one first referred to is about 10 miles to the east. Cross, the miner referred to, had been prospecting the former lead east of Bingera. I also found him at work prospecting the second lead west, with somewhat similar results. He was prospecting on the flanks of a high basalt-capped hill—a defined old river-bed. Had sunk shaft after shaft under the level of existing watercourses, and found the wash dipping into and under the hill in every case. At this point he had come across a The Gwydir. Height of basalt lead. The diamond drift. Lignite. Water-worn wash. Another basalt bed. Old river-bed.

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nice prospect of heavy water-worn gold, which I examined, obtained from highly water-worn gravel-wash. Lignite and water in abundance existed in this case also. Our conclusions agreed, viz., that these two leads take their rise from the high lands on the dividing range in the New England district.

2538. *Mr. Murray.*] What hill is that? It is in a direct line with Bingera and Inverell. There is, I understand, tin not far from there. Mr. Cross informed me that he had prospected, he thought, on this same lead for nearly 100 miles towards its upper end. I had observed the existence of such a lead trending west, at Uralla, years ago.

2539. *President.*] Are they both full of water? Yes; and there is no chance of the miners working them except on the high ground further up in the mountains.

Old river-beds in Victoria.

2540. Have you any other cases? Yes; there is another case in Victoria to which I may as well refer. I happened to be the lessee of the Seven Hills Estate in 1861. The estate consists of 7,000 acres, and, as is well known, contains some rich gold mines. I have ridden over the plains there, through a mass of basalt. For 20 or 30 miles it is comparatively flat country. In those days I had no idea that we were sleeping over gold, or I should not have left there to look for gold elsewhere. I am acquainted with the ground held by the Madame Berry's Claim. The diamond drill was set to work in this district in 1877.

Birch's Creek.

Birch's Creek is the largest in the immediate district. As nearly as I can estimate, Madame Berry's Claim is about 250 feet below the level of Birch's Creek. The lead is making directly across the creek. They have traced it making at right angles to it, and with all the machinery they can supply the miners

Basalt formation.

are nearly forced out with water. It is a basalt formation, and a notable point in connection with the matter is that the lead has started from the high ranges towards Ballarat, just as those leads described start from the highest ranges with us. There is so much water that all their engineering appliances can hardly cope with it. I know that this basalt formation continues through Smeaton Plains at least 40 miles, but where it goes to I do not know. That is trending about north-west also.

Other instances in N.S.W.

2541. Do you know of other instances in New South Wales? Yes, there is the Gulgong one. Hanging Rock, near Nundle, is the starting-point of another. I have crossed those basalt-covered lands several

Ben Lomond.

times at several places. There is another starting from Ben Lomond, the highest point in New England.

2542. *Mr. Franklin.*] On the western shed? Yes. Another well-defined basalt lead further north—one

Vegetable Creek.

which I have worked upon a great deal—starts from the table-land near Vegetable Creek. That trends towards Inverell. I have worked on it, starting on the high ground and down to and below the existing creek. I pointed out where this lead was trending to when I went over the ground ten years ago. There

Caroola. McIntyre River.

is another lead which starts near Caroola, and they are working that, making for below the level of the McIntyre River.

Direction and inclination of the leads.

2543. *President.*] Is that leading west also? It is. They all trend toward the west, some going a little northward. The inclination of the leads is to the north-west; the existing rivers go more to the south-west.

Cases west from Sydney.

2544. Do you know cases out west from Sydney? Yes, Gulgong, near Mudgee, to which I have referred, a deep lead of basalt formation, with water very plentiful under.

2545. Were you ever at Hill End? Yes, I know almost every mine at Hill End.

Rock formation at Hill End.

2546. Is there anything similar there? No; it is a high-lying primitive rock formation. The outline of the trap rocks bears nearly right along the main range. Large deposits exist at Kiandra, Canoblas, Nundle, Uralla, Ben Lomond, and Mole Table Land.

2547. Have you any plans showing those leads? No, but I might be able to sketch them out. I had plans accompanying reports when I was employed by private people. I supplied over 300 such reports, but I do not suppose I could lay my hands on them now.

Plans.

2548. Can you give us information as to where we are likely to get plans, if we are desirous of following out these leads and placing them on paper? Looking at the geological map, I should think it is no

Flying surveys.

assistance to trace through leads. It would be very easy for the Commission to take flying surveys. I could obtain certain reliable information by writing to miners I know, and asking them to fill up the gaps unknown to me along such leads.

2549. Could you take a skeleton map of the Colony and place these leads approximately? Yes, but there

Special geological surveys.

are others not sufficiently known to me; the work refers to a large scope of territory, and I think should have special geological surveys made for this purpose alone.

Underground streams in the basalt formation.

2550. To sum up the whole matter: I suppose your opinion is that there are large underground streams of water running in the basalt formation; that these start from the main ranges which run north and south, and go in a westerly or north-westerly direction? Precisely so. I have travelled on and adjacent to the high lands right through Victoria and New South Wales on to the Darling Downs in Queensland ranges. I have mined underground in many of such ranges and paid close attention to my work. All bear out the same theory.

Artesian water in western plains.

2551. You are now sinking for water in the western plains of the Colony—do you find it artesian in many instances? Yes.

Source of artesian water.

2552. Is it your opinion that artesian water comes generally from the source you have referred to to-day? Yes, and I am convinced that there is such a large quantity of water existing that no one has any conception of the quantity that will be got by searching for it, within the next ten years. If we prospected to the head of the leads which I have been describing, we should find immense quantities of water.

2553. But you cannot have more than falls from the clouds? I think so. The matter has been very

Two different underground streams.

little looked into by scientific men. I have struck two streams of water underground within 10 feet, differing entirely in trend, quality, and temperature.

2554. What I mean is that the original source is rain? Yes, but water is taken into the earth in one

The action of the earth's crust on the water.

part of its surface, and thrown out in another by forces other than gravitation. The earth's crust acts like a steam pump or hydraulic ram, taking in the water in one place, compressing it into force, and thus throwing it out elsewhere. I believe that if we tap the primitive rocks in the interior, in certain instances,

Water in primitive rocks.

to say nothing of the old river-beds, such rocks will be found to give water other than that resulting from the local rainfall. I am sure of it, because I have proved it in practice.

Water from other parts of the globe.

2555. Have you a theory that water comes from other parts of the globe and makes its exit here? I decidedly think so, at least adjacent parts of the globe. I could not say how far the water comes. I have seen it stated on good authority that water has issued out of the earth's surface 500 miles away from where it originally fell in the shape of rain.

2556. I said that we must look to the rainfall in the first instance, but I understood you to say that we must

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must look to some other source? I would not say positively to force my opinion that water comes from a given line outside the Colony; but where does the water in cases of artesian hot springs come from, unless it is accounted for by the proximity of some volcano near by?—That is not so in all cases; water does not come from the immediate clouds, or from surface lines laid down or known to man.

Level of underground water.

2557. *Mr. Franklin.*] The water discharging through these leads I suppose is traced below the ordinary levels of the beds of rivers? Yes.

Interception and storage.

2558. Do you think it would be possible to intercept the water and store it in large bodies? Yes. I have worked under the surface of the earth in the several Colonies during a great part of my life, and my impression is that throughout Australia we shall yet find a very large number of artesian wells, because there is an outlet or escape. The water will, in my opinion from practical experience, be found to come up a certain distance and then escape; but there will be immense quantities of water to be got over large areas of Australia, at depths ranging from 40 to 80 feet. Water rising to such a level will be very easy got at by pumping it up. A return from South Australia, Victoria, and New South Wales, herewith in part handed in (*Appendix* O 1), shows that more than two-thirds of the bores put down have struck good water. In working out returns of water found in the Colony, I endeavour not to over-estimate the results obtained. I found, as a rule, that the water is the strongest when it is first struck. Sometimes pumping is kept up for a couple of days, then when it is finished the standard is ascertained and the return is given. We have obtained more fresh water in proportion than South Australia, and much more than Victoria. In looking for an explanation of this, I find that Victoria has the shallowest bores and South Australia has some of the deepest; but New South Wales has, on the average, the deepest, and it is the depth that has given us the largest proportion of fresh water. If, in Victoria, the wells or bores were made deeper no doubt the result would be more favourable. Some of the wells sunk under my supervision give salt water, but we are proving every day that the salt water is merely superficial. If we go to a medium depth, no doubt we shall get yet more good or fresh water. We ought, I think, to go to a depth of from 500 to 1,000 feet if fresh water is not obtainable sooner. I believe, however, in going down to a considerable depth to test the matter of primitive rocks. So far we have been lucky in getting water at shallow levels.

Immense quantities of water.

Returns of water found in the Colony.

Depth of bores.

Interception of permanent leads of water.

2559. If these permanent leads of water are intercepted at such places as Ben Lomond, would it not be best to store it on the slopes of the hills? Yes; the best course is to make it available for gravitation, and so to catch what is actually available first without allowing it to go to waste. A bird in the hand is worth two in the bush.

Ground for storage.

2560. Do you think we should find impermeable ground on the mountain slopes where we could store water? Yes; there are nice clays on the high lands which could always be depended upon in making excavations.

Sites for practical operations.

2561. With reference to the places you have pointed out, could we, without much difficulty, pick out sites for practical operations? Yes, easily. The more trouble people generally take with regard to the construction and cutting out of dams, the worse they are generally to combat with Nature's laws of force of penned-up water. I have had a great deal of experience with regard to dams. People, as a rule, dam creeks in the wrong places. If they would observe the provision that Nature has made, and make dams where there are side-way flats, it is there that the water will stand. If they dam the water in the confined precipitous situations everything goes.

Position of dams or creeks.

Boring at Warrigul.

2562. *Mr. Barton.*] Do you know anything of some experiments in boring which have been carried on by a Mr. Bignall at Warrigul? Yes, I supplied him with a list of things necessary to carry out that work.

2563. Do you know whether he has been successful? Yes, he has got water in the three bores which he has put down, but he had in instances to sink shafts. In the first case he sank the shaft to a certain distance, then bored. I retain a paper giving particulars of the boring. (*Appendix* O 2.)

Diamond drill.

2564. Is it the diamond drill that he has been using? Yes, but I converted the drill into a steel cutter as well. It could not have gone to work without water, but he had water in a shaft which he had already sunk. I supplied him with a list of the necessary tools and tubing, and made the undertaking a success.

Cost of machines.

2565. *Mr. Murray.*] I should like to arrive at the cost of these machines. You say that Mr. Capel pays £5 a week for his water auger: are there many availing themselves of these augers? There are two out on hire now.

2566. How many augers have you? Eleven.

2567. Are they all at work? All except one.

2568. All working for the Government in dry country? Yes, on stock routes.

Particulars of cost.

2569. Have you made any calculation as to the cost per foot? Yes, I gave all the particulars of cost to the President to-day. (*Appendix* O 3.)

Result from hiring out augers.

2570. Have the augers as a rule been hired out at a loss to the Government or at a profit? The object of letting them out at £5 a week as per regulation is to make them pay all expenses. The foreman in charge who goes with the auger generally receives £3 10s. a week, and the balance is taken to be sufficient to cover the cost of wear and tear. The hirer supplies everything outside the plant as originally sent out. The man in charge who goes with the auger reports what he does every week to the Department.

Report on operation of the drills.

2571. Will you let us have a report as to the operation of these drills? I lay the annual report before the Commissioners, which will give the most minute information for the past year. I have taken great pains in putting the particulars on record, in order that some information might be afforded to the public, to whom the working of the diamond drills and augers seems to be a mystery hitherto. Some bores cost as low as 4s. 9d. a foot, but the average, as per report for the year 1883, is 10s. 3d. I have taken pains to provide the fullest information, so that the public shall know what a drill is, its cost, and how or for what it is worked.

Ballarat deep leads.

Rise of water in the shafts.

2572. *Mr. Gipps.*] Do you know anything of the Ballarat deep leads? Yes.

2573. Do you know the level to which the water rises in the shafts? I have handed in a statement which contains particulars. (*Appendix* L 7.) That statement will show that a few mines there have been pumping on the aggregate as much water as all Sydney. If that is on the top of the watersheds or dividing range of that Colony, it shows what we may expect in the west of the watersheds of this Colony. The "City of Ballarat" mine alone pumps something like three to five million gallons a day, and has been doing this for two and a half years without showing any sign of abatement. From a comparatively small area seven mines on the aggregate pump upwards of twenty million gallons per diem; one mine pumping for two and a half years with little or no signs of decrease.

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2574. Have you adopted any system in examining the subterranean waters of the interior? Yes, we test the water both when we strike it and at stated periods after it is struck—after a time.

Weekly tabulated reports.

2575. How far have you adopted any system of sinking your bores to show the inclination of your shaft? A tabulated report is filled in weekly by the foreman in charge that gives the strata, the depth of the water met with, and other particulars.

Direction of inclination.

2576. What system do you adopt in actual boring; do you make a bore, then go 7 or 8 miles away; or do you test the inclination by boring again a mile north, south, east, or west? Yes, we test the inclination, and when I get the different sections out I am able to see the direction of the inclination. By the aid of such sections I find that there is a dip of 60 feet to the mile from the Goonery Bore B 3, and the one (D) 7 miles further to the west.

Machinery.

2577. What machinery for boring do you recommend? The Australian water auger is by far the best. I herewith give in a statement of the results of the test of each class of borer named. (*Appendix* O 4.)

2578. Does that apply to soft strata and rocks? Not to rocks; nothing will touch the diamond drill for hard or dense rocks.

Diamond drill.

2579. What diamond drill do you recommend? Bullock makes one far superior to any that I have seen. It will work with half the diamond cost that any other requires—it will work a revolution in diamond drills.

Improvements in boring for water.

2580. Do you think you could suggest any improvement in the system of water-boring in the interior? Yes, by making the machines applicable to the different districts. For instance, where the carriage would be difficult, the machines should be light and made of steel. Where water is scarce diamond drills or steam power cannot be used. Where strata is medium hard to soft, steel cutters are best; but the most important of all is to have a practical knowledge of the many peculiar strata met with in inland Australia, and to be able to adopt and lay out the tools applicable to each stratum; without this knowledge (Australian) costly failures will ensue.

Corrosion in tubes.

2581. Do you find much corrosion in the tubes? No, not so far.

2582. Yet you go through this salt-water stratum? Yes, that does not seem to affect the tubing.

Pierce and Tiffin borers.

2583. Are you acquainted with the Pierce and Tiffin borers? Yes.

2584. Is there any similarity between them? They are almost exactly similar. If there is any difference, the Tiffin is an improvement on the Pierce borer.

Australian auger.

2585. You think that the Australian auger is the best? Its main parts of mechanism stand first for inland circumstances. It will do one fourth more work than one of the other augers, and doubtless at a less expense.

Shutting off salt water.

2586. What plan have you adopted for shutting off the salt water? When we desire to shut off the salt water, we drive the tubing down till we get to the rock or impervious clays. It is quite easy to combat with salt water.

Use of cement.

2587. Do you use any cement at all? Yes, we drop cement in between the two sized tubes in our telescopic order of boring, and it makes the joint as hard as a rock. In the event of no suitable clays being met with to drive the tubes down into, cement in cartridges is dropped into the bore, filling the hole up some feet; the drill-rods are then lowered, plugged in, and pressure is then applied and the tubes driven down, and thus behind and upwards in the tube a perfect water-tight bore is the result, boring being continued deeper after the cement sets, which, as a rule, does not require time so to interfere with work of boring going on. If you use tubing you are obliged to reduce your bore, but with cement you

Diamond drill.

can keep it one size—cementing on the method last described. The experience which one gets with diamond drills is the best. You cannot bore with a diamond drill unless you keep the bore perfectly water-tight. Experience with a diamond drill under steam, hydraulic water pressure in the bore, surpasses all that a man gets with the water augers—well-drilling machines. I have used brown paper, wheat, and linseed occasionally to keep the water out, but I never found anything equal to cement, which never fails. As a rule we lose the water five or six times every bore put down with the diamond drills, so the necessary experience to shut out or shut in water in boring is very soon learned.

Fresh water beneath salt water.

2588. *Mr. Barton.*] Have you ever found a large quantity of salt water without fresh water underneath? Not when boring was continued to any ordinary depth.

Cost of tubing.

2589. What is the cost of the tubing? The last tendered price was from 4s. a foot for 7 inches in diameter down to 10d. per foot, 2¾ inches in diameter. The best tubing is got from Europe, and it is remarkably cheap, the cost being about half that of equal gauge lining from America. The representative of a Company carrying on boring works in New Zealand, under the American principle, recently applied to me for some information as to this class of tubing known as artesian tubing. There is only one house that makes this special tube that I am aware of in Great Britain. There is another house in Germany that comes close to it in form, quality, and price.

Joints.

2590. *Mr. Franklin.*] Is the lap flush on the outside? You would not notice the joints. They are differently made from any other tubes I have seen. They are made by Messrs. A. and J. Stewart of Glasgow, who, I understand, are sending them all over the world. If it had not been for this class of tubes I should have been stuck fast with the boring in search of water inland in this Colony.

THURSDAY,

THURSDAY, 27 NOVEMBER, 1884.

Present:—

MR. BARTON, M.P.,
MR. DONKIN, J.P.,
MR. FRANKLIN, C.E.,
MR. GIPPS, C.E.,
MR. LYNE, M.P.,
MR. M'MORDIE, B.E., C.E.,
MR. R. L. MURRAY, M.P.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. Cornelius Haylock called in and examined:—

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2591. *President.*] You are a licensed surveyor? I am.
2592. In what district? I have been in charge of parts of the Cooma District for about seventeen years.
2593. Have you had charge of work in any other parts of the Colony? No; I have worked in other parts of the Colony, but I have not had charge.
2594. In what parts? I was at Grafton a little while.
Murrumbidgee and Snowy Rivers.
2595. Can you give us your opinion in reference to the country at the head of the Murrumbidgee and the Snowy Rivers? I can.
2596. Will you tell us what you know about those places? I was employed to survey the boundaries of the Tantangara Run some years ago. At one point of it, where the eastern boundary of Tantangara strikes the Murrumbidgee River, there is a remarkable gap. It strikes me that a reservoir might be formed there. I hand in a tracing of the spot; it is at the point marked A on the tracing. (*Appendix* P.)
Remarkable gap.
Unsettled state of country.
2597. *Mr. Donkin.*] Is there any township near the place? No. At the time of the survey no measurements for sale or alienation of land had been made there. There is a selection of 600 acres marked on the tracing, and there are pre-emptive leases, but the country was then in an unsettled state, no alienations of land having taken place.
Position.
2598. What is the general position of the locality from Queanbeyan or Cooma? It is to the north-east of Kiandra. The gorge is a cut through what appears to be an even ridge.
Reservoir.
2599. *President.*] And you consider that a reservoir could be built to store an immense quantity of water? It is some years since I was there, but it struck me at the time that a large area of country might be put under water.
Altitude.
2600. Can you give us any idea of the altitude? I cannot form an opinion; but it may be readily determined approximately by the use of the aneroid barometer.
Area.
2601. Have you any idea of the number of miles? I should say that the area would be 10 miles square—varying from 10 square miles to 100 square miles, depending on the height of the dam.
Depth.
2602. And about what depth? It would be very difficult to say, because I have lost the exact recollection of the height of the ridge.
2603. *Mr. M'Mordie.*] Do you mean 10 square miles or 10 miles square? I mean 10 square miles.
2604. *Mr. Donkin.*] What is the depth, roughly speaking? I think it is about 100 feet. I should not like to hazard a guess.
Nature of country.
2605. What kind of country would be covered? Judging from its appearance it has at some time been under water. The river has gradually cut its way through the rock, and by degrees has formed the channel of the Murrumbidgee.
Inland sea.
2606. *President.*] Has there been a lake? A sort of lake or inland sea, I should say, at some former time.
Quality of land.
2607. Is it good or inferior land? It is tolerably good land.
Snow.
2608. I suppose it is covered with snow in the winter? Yes, to a depth in some seasons, I believe, of 6 or 8 feet.
Height.
2609. Do you know the height? I do not; I was on the point of going up with the barometer when I was called to Sydney by telegram.
Snowy River.
2610. Have you been to the head of the Snowy River? I have not been to the head of the Snowy River, but I know it at a point at and a little above its junction with the Eucumbene.
Eucumbene River.
2611. Have you been further up the Eucumbene or Snowy River? Considerably further up the Eucumbene, but not further up the Snowy River.
Width and depth of Eucumbene River. Good stream.
2612. What size is the river at the point of junction—of what depth is the bed? It varies from 2 to 3 chains across. It is a very dangerous river to cross. There is a solid rocky bottom with crevices, into which horses are apt to get their feet. The water comes up about half way between the girth and saddle flap. There is a quantity of water at a certain season, but at all times there is a good stream running in the Snowy River.
Velocity.
2613. *Mr. Franklin.*] What is the velocity? When I was working on the Snowy River at Buckley's Crossing, I estimated that with a very slight fresh the river ran about 4 miles an hour.
Dividing ridge.
2614. *President.*] Have you been along the ridge above Cooma dividing the Snowy River from the watershed of the Murrumbidgee? I know it well.
Levels.
2615. Have you ever taken levels there? I have.
2616. Have you taken any levels at the junction of the Snowy River and the Eucumbene? No; I have taken them at the top of the range and at Buckley's Crossing on the Snowy. I have them in Sydney, but have not brought them with me now.
Nature of country.
2617. What is the nature of the country between the junction of the Snowy River and the Eucumbene and the Dividing Range? Hilly.
Varney's Range.
2618. Is it very rugged? Not very rugged. The main road passes over what is known as Varney's Range. Whether you could avoid it or not I cannot say, but I think it might be done by a detour.
Diversion of Snowy River water.
2619. Can you give us any information as to the possibility of diverting the water from the Snowy River and the Eucumbene and throwing it over the range into the Murrumbidgee valley? I have no information upon that point. The lowest part of the range is between the two roads, and at the lowest point there would be a natural flow into Slack's Creek.
2620. That is one of the heads of the Murrumbidgee? Yes.

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Survey. 2621. What is the distance from the junction of Eucumbene and Snowy Rivers to Slack's Creek? Roughly speaking, about 20 miles.

Levels. 2622. Do you think it would be desirable to take levels and make a survey—do you think there is sufficient prospect of our being able to carry out the work? I do not think I should be right in hazarding an answer, because I do not know the levels. I have not worked out my own levels on to the Coolringdon Road. I can give you the difference of the levels by barometer from the gap near Coolringdon, at the head of Slack's Creek, and the levels of the river at Buckley's Crossing. Allowance must be made for the fall between the junction of the Eucumbene and Snowy Rivers and Buckley's Crossing. It would be impossible to say, without a knowledge of the levels, whether the work could or could not be carried out.

Discharge of Eucumbene River. 2623. Is there a great body of water coming down the Eucumbene? Not so much as on the Snowy River. The Eucumbene always runs; but the Snowy is the main river.

Snow water 2624. It is snow water? Yes—beautiful water.

Season of greatest discharge. 2625. At what time of the year has the Snowy River most water? It carries most when the summer is coming on.

2626. How long does it last? Until about January. It always flows, but the main body of water comes down when the snow commences to melt.

Diversion from Eucumbene and Snowy Rivers. 2627. *Mr. Donkin.*] You could not say from your own knowledge whether it would be possible to bring water from the junction of the Eucumbene and Snowy Rivers over the Dividing Range? I could not say from my own knowledge.

2628. *President.*] Have you any further general knowledge of the rivers which flow into the Snowy River? I have no further knowledge.

Width of gorge. 2629. *Mr. Donkin.*] Of what width is the gorge on the Murrumbidgee of which you speak? It is some years since I made the survey.

Depth. 2630. Is the river deep at that point? It was not running in any great body when I was there. It embraces a large watershed.

Fall of Murrumbidgee. 2631. *Mr. Gipps.*] What is the fall of the Murrumbidgee at the point you mention? I can hardly say.

2632. Can you give us no idea? It might be 5 or 6 feet in the mile.

2633. *President.*] Is it 5 chains across? Not the bed of the river.

Banks. 2634. Do the banks rise perpendicularly? The rocks come right into the alluvial banks of the river.

Rise of country. Area. 2635. *Mr. Donkin.*] But are you sure there would be 10 miles of water above this point? As you get to the range the country rises rapidly.

2636. That would be about 100 square miles? About that I think.

2637. You are returning to Cooma? Yes.

2638. Are you likely to be at the Eucumbene? I am not likely to be over there.

Reservoir in the Murrumbidgee. 2639. *President.*] You know of no other places similar to these? No, excepting on the Murrumbidgee—it is an unsurveyed portion of the river—there the river bed itself could be converted into a reservoir.

2640. Where is that? Just above Cooma. The country is very rough and precipitous, and it has never been surveyed. The reservoir could be made only by a masonry wall.

Masonry wall. Building material. 2641. That would be an expensive work? The material is to be found on both sides, and it is workable stone; lime is tolerably abundant.

Depth of rivers. 2642. What is the average depth in the case of the Eucumbene and Snowy Rivers? About 3 feet 6 inches—or say 3 feet taking the average.

Tantangara Creek. 2643. *Mr. Donkin.*] Is there any quantity of snow-water coming down the Tantangara Creek? There is not very much snow lying on Tantangara in the summer months.

2644. Is the river always running at this gorge? I believe it is.

THURSDAY, 4 DECEMBER, 1884.

Present:—

Mr BARTON, M.P.,	Mr. GIPPS, C.E.,
Mr. DONKIN, J.P.,	Mr. LYNE, M.P.,
Mr. FRANKLIN, C.E.,	Mr. MURRAY, M.P.,

Mr. M'MORDIE, B.E., C.E.

W. J. LYNE, Esq., M.P., President, in the Chair.

Mr. Richard C. Webb called in and examined:—

Mr. R. C. Webb. 4 Dec., 1884.

2645. *President.*] Your residence is—? Kilfera, Darling district.

2646. How long have you resided there? A little over three years.

2647. Have you had experience of a variety of seasons? Yes, as I have been in the Riverina district about twenty years.

Kilfera Run. 2648. Have you effected any improvements on Kilfera Run? Yes, we have effected large water improvements in the shape of tanks and wells.

Wells. 2649. How many wells have you sunk? We generally sink trial shafts first. Within the last three years we have sunk from 150 to 200 trial shafts.

Trial shafts. 2650. Do you mean that you put down bores? No; the trial shafts are about 4 feet by 2 feet, and we run them down until we strike water.

Depth to water. 2651. At what depth do you strike water as a rule? From 40 to 190 feet. About 200 feet is the lowest depth which we have done without striking water. The water is always very salt at the shallow depths.

Depth to salt water. 2652. At what depth do you get salt water? The nearest the surface is 40 feet. I have had some of the water analysed, and it contained 2,200 grains of salt to the imperial gallon.

Strata. 2653. In what kind of strata do you find the salt water? In different kinds of strata; sometimes in clay and ironstone, and sometimes in drift.

2654. Have you ever had samples of the strata submitted for analysis? No. I have not heard of any one having had that done. The greater part of the strata through which we pass is clay and gypsum.

Rise of salt water. 2655. Does the salt water rise in the shafts? Yes, in some cases as we go down the water rises very high.

Mr. R. C. Webb. 4 Dec., 1884.

2656. How near to the surface? About 30 feet is the greatest rise we ever had.
2657. Do you put down bores? Yes, in nearly all the wells; we could not use the water unless we put down tubes a good distance below the salt water. We find that the deeper we go the better the water is.
2658. Does not the water rise to the surface when you tube the bores? No; we have not gone deep enough for that. We continue the bores until we get a sufficient supply of water for the stock. The further we bore the higher the water rises. We have not gone beyond 320 feet in any of the bores. — Depth to water. Rise of water.
2659. In how many of the 200 trial shafts did you succeed in getting good water? We have only two wells in which there is really good water, and that is water on which human beings could not live for any length of time. The water which we call very good contains about 500 grains of salt to the gallon, but we use some which contains as much as 900 grains to the gallon; but it is not a good thing to use such water in a dry season. — Good water.
2660. In how many of your wells is the water sufficiently pure for stock? Twelve. North of the Willandra we cannot get good water. — Water north of Willandra.
2661. Have you any wells north of the Willandra? We have one or two about 10 miles back, but after that there is not one good well.
2662. How do you account for the water being struck at different depths? If we sink a well in a hollow we strike water much sooner than in a well on an eminence. — Cause of varying depth to water.
2663. Then the water must come from the same strata in the different wells? That would appear to be so, judging by the depths in relation to the surface; but it is not so judging by the quality of the water, as in some of the wells it is very much salter than it is in others. — Source of water. Quality of water.
2664. What is about the average depth at which you strike water? About 100 feet; but we have to go down from 160 to 180 feet to get a good supply. — Average depth.
2665. Is the strata between the two points water-bearing? Nearly always; but sometimes there is a break of a few feet. — Water-bearing strata.
2666. Is the strata all the way down the description of clay which you have mentioned, or is there any sand drift? The strata is always changing; there is a change every 2 or 3 feet, except when we get a sandstone bar. — Nature of strata.
2667. And what is the thickness of the sandstone? The thickest bar we have had has been about 20 feet. — Sandstone bar.
2668. At what depth was that from the surface? From 90 to 100 feet. We had to sink 165 feet in that shaft before we got water. — Depth from surface.
2669. Do I understand you to say that the strata through which you pass from the time when you first strike water until you discontinue sinking is generally water-bearing? Yes, the quantity increases as we go down; we continue the shafts until the water gets too strong. I have seen the water rush up carrying 4 feet of earth with it. — Supply from water-bearing strata.
2670. To what height does the water usually rise in the wells? It varies; in some cases it rises 60 feet from the main spring, and in others only 16 feet. — Rise of water.
2671. Take the well in which you say that the water rises 60 feet, can you reduce the water materially by watering stock from it? We can lower it about 10 feet.
2672. How long does it take before the water regains its original level? I have not taken particular notice of that, but I should say about half an hour.
2673. What quantity of stock can you water at that well? Any number; there is an endless supply of water. — Supply.
2674. How do you raise the water? We have steam pumps in some of the wells; but we generally use whims with 60-gallon buckets, which will raise from 2,000 to 2,500 gallons per hour. — Raising of water.
2675. What is the nature of the surface of the Kilfera country? It is covered with salt and cotton bush and scrub, and is very flat, there not being a rise of more than 100 feet all through it. — Nature of surface.
2676. How far is your station from the Darling? The nearest point is about 60 miles. — Distance from the Darling.
2677. Have you observed that the water flows in any particular direction in the wells? No, the water seems to come in on all sides. I have heard it stated that there is a flow from the north-east to the south-west. — Direction of water-flow.
2678. Then the water comes from the mountains? Yes; the well-sinkers have told me that.
2679. Have you made any improvements for the storage of surface water? Yes; we have some very large tanks, and we have found them much more successful for stock than wells are. — Storage of surface water.
2680. Is the nature of the surface such as will hold water? Yes. — Nature of surface.
2681. What is the size of your tanks? From 10,000 to 17,000 yards. (*Appendix* Q 1.) — Size of tanks.
2682. What depth? From 15 to 20 feet.
2683. What do you consider the best depth for a tank? It depends on the size; a 10,000 yards tank ought not to be less than 15 feet in depth, and any size beyond that 20 feet; you cannot have a tank too deep. — Depth.
2684. Do you use ordinary scoops? No, the work is done with ploughs and horses and drays. The seasons have been too bad to permit of scoops being used. — Appliances to dig the tank.
2685. Why? Because it takes more horses to work them.
2686. What is about the cost per yard? We have let large contracts of 100,000 yards each, and in consequence have had the excavation done for 11½d. per yard. — Cost.
2687. But there are other expenses? Yes; the cost of boxes, shoots, drains, and fencing, brings up the total cost to about 14d. per yard.
2688. Have you made any dams in the watercourses? No; the country is too low for dams to be of any use. — Dams.
2689. Are there any inundations? There are small swamps where we make the tanks. If cane grass is growing in the swamp we make the tank on the edge, because these swamps are generally very dirty; we divert the water which would run into the swamp into the tank. If there is a box swamp, we make the tank in it, because in box swamps the water is clear. — Swamps.
2690. The tanks in the box swamps are of larger capacity than those which are made on the edges of the cane swamps? Yes, because they hold twice as much water above the surface as in the excavation. — Capacity of tanks.
2691. Have you any idea as to the extent of the evaporation? I have not made actual tests, but I do not think that the evaporation is as great as it is supposed to be. There is a good deal of soakage when the water is stored above the surface, but not much where the water is contained in the excavation. — Evaporation. Soakage.
2692. Have you seen any of the ana-branches of the Darling? Yes, I have crossed them. — Ana-branches of Darling.

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Value of country. 2693. Do you think that any advantage would be gained by diverting water from the river into the ana branches? The advantage would be very great, and I believe that by putting weirs in the river the advantage could be gained without any injury whatever to the people lower down. By diverting water into the ana-branches the value of the country would be enhanced 400 or 500 per cent. The Lachlan and the Darling country carry a great deal more stock after the ana-branches have been flooded than at other times.

Nature of country. 2694. Is the country of such a level nature that water could be thrown back a considerable distance in time of flood? There is very little rise or fall in the Darling country—it is almost level. If a weir were put in the Lachlan so as to run water into the Willandra, that country would carry much more stock than it does at the present time.

Quality of land. 2695. It is all good country there? Yes, when there is water; but during the last three years the country has carried next to no stock, owing to the want of water.

Weir on the Darling. 2696. Do you think that an ordinary weir would stand on the Darling? If it were well constructed, I should think that it would; there would be nothing to prevent it standing, as there is no heavy rush of water in the river; it is a very sluggish stream. The Lachlan is dammed in many places now. These dams stand well enough, but they are generally cut away when water is wanted.

Dams on the Lachlan. 2697. They are large dams? Yes, they are above the level of the channel.

Overshot dams. 2698. Do not you think it would be better to have overshot dams? Yes, I think that they would be much the best.

Danger to banks. 2699. Do you think that with an overshot dam there would be any danger of the banks giving way? No, there would be no risk beyond that which usually exists in connection with dams. A large quantity of

Waste of water. water is run to waste owing to the want of a system of dams. The other day there was a rise of 8 feet in the Lachlan; the water ran for some time, and if there had been a weir across the stream a fair flood would have been sent down the Willandra.

2700. If you were supplied with a parish map could you mark the positions of your wells on it? Yes.

Depth of bores. 2701. *Mr. Franklin.*] Have any bores been put down in your part of the country to a greater depth than you have stated? There are no bores deeper than 300 feet. Boring is a difficult and an expensive undertaking.

Record of strata. 2702. Have you kept any record of the strata passed through in sinking the various wells on your run? No.

Formation. 2703. Is the country in which you find water in your district nearly the same formation as is seen in a section of the Murrumbidgee? I have not seen the strata of the Murrumbidgee wells, but I know that the water from those wells is much superior to that in ours.

Sample of strata. 2704. Can you supply us with a general sample of the strata passed through in your wells? Yes.

Situation for tanks. 2705. What, in your opinion, are the best situations for large tanks in that country? On the edges of the large swamps. I should never make a tank in a cane-grass swamp, because those swamps hold a tremendous lot of earth in suspense, and if a tank were made in one of them the water would soon become impregnated with clay. If you were to take a 10-inch bucketful of water from one of those swamps, and were to precipitate the mud with gypsum, you would find 2 inches of sediment settled on the bottom.

Drainage levels. 2706. In selecting a site for a tank how do you prove the drainage levels—by instruments? We do if we have any doubts, but as a rule this is not necessary, as there are sufficient indications to show which way the water runs. If we are making a tank on the edge of a swamp we select the lowest corner, and make drains all around the swamp.

Collecting the water by open drains. Silt-tanks. 2707. What means do you adopt for collecting the water from the drainage area beyond any given point above the tank? Open drains which lead into a silt-tank, from which a flume conveys the water into the large tank. The majority of people have not made silt-tanks, and the result is that the tanks are filled up with mud in the course of a year or two, and become large bogholes.

Disposal of spoil. 2708. How do you dispose of the earth taken out in excavating the tanks? It is formed into banks a chain and a half away from the tanks. These banks prevent the sand from blowing into the tanks, and they have this further advantage, that is, if there has been a good fall of rain we can pump a large quantity

Storage above level of ground. of water into the tanks from the swamps. This water is stored above the level of the ground.

Slope of batters. 2709. Do you make the tanks so that stock may go to them for water? Yes, in all cases. I notice that the Government make tanks with steep sides of 1 in 1, but this is a mistake, as the wash undermines the banks, carries dirt into the tanks, and ultimately reduces the slope to 3 to 1. The tanks might as well be made on this slope in the first instance.

2710. With a 3 to 1 slope is it necessary to have any protection in the shape of an apron? No; that slope is rather steep for stock, but they can get to the water from it. All our dams have slopes of 4 to 1 or 5 to 1.

Trees around tanks. 2711. Have you done anything in the way of planting trees around the banks of the tanks? No; the seasons have been too dry, but I think that it would be an advantage.

Cost of trial shafts. 2712. *Mr. Murray.*] What is the cost of sinking the trial shafts to which you have referred? From 2s. 6d. to 5s. a foot. The average depths of the shafts is about 100 feet, and we reckon that they cost £15 each.

Abandoning the shafts. 2713. When are the shafts abandoned? As soon as water is struck generally. Directly the men strike water they bring me a sample of it, and if I find that it is too salt for stock the shaft is abandoned, but otherwise the shaft is proceeded with. We do not proceed with the shafts now if we find that the water contains more than 800 grains of salt per gallon.

Particulars sent to Department of Mines. 2714. What are the depths of the wells in which you have struck what you call good water? I have sent full particulars respecting the wells to the Mines Department.

2715. *President.*] Would you have any objection to the document being added as an appendix to your evidence? Not the least. (*Appendix* Q 2.)

Proportion of salt. 2716. *Mr. Murray.*] What is the maximum proportion of salt in water which is fit for stock? It all depends on the feed which the sheep get. If they get good feed they may drink water containing 900 grains of salt to the gallon; but as a rule it is not safe for them to drink water containing more than from 600 to 650 grains per gallon.

2717. Is it upon the quality or quantity of feed that the use of the water depends? If there is abundance of feed the sheep can drink salter water than they can otherwise.

Nature of strata. 2718. What is the nature of the strata in the shafts when you get down from 130 to 160 feet? In some cases there is coarse drift, and in others a sort of white pipeclay.

2719.

Mr. R. C. Webb. 4 Dec., 1884.

2719. Do not you think it likely that if you were to go down deeper the water would improve in quality? I am convinced that we should get an artesian supply of fresh water if we were to go through the salt beds.

Depth to perfectly pure water.

2720. At what depth do you think that you would get perfectly pure water? Between 700 and 1,000 feet.

Test boring.

2721. *President.*] Do you think that the indications are sufficient to justify the Government in putting down a bore to test the water at lower depths? Yes. In putting down bores we found that in almost every 10 feet there was an improvement in the quality of the water; but we have not been able to bore any deeper, as the men do not understand the working of the apparatus.

Price of excavating.

2722. *Mr. M'Mordie.*] You said that you had tanks excavated at 11½d. per yard: did the contractors find horses, plant, and everything necessary for doing the work? Yes, but we allowed them grass for their horses. That price was paid for excavating only. The price was low because the job was a large one. We have paid as high as 1s. 6d. per yard for excavating.

Cost of well sinking.

2723. *Mr. Donkin.*] What is the cost of sinking wells? The mere sinking costs 30s. per foot; we find the casing, and the contractor puts it in.

Piping.

2724. What do you tube the bores with? 3-inch iron piping.

Boring rods.

2725. What boring machine do you use? Ordinary boring rods, worked by hand power.

Tiffin borer.

2726. Have you tried any of the American machines? No. I have seen the Tiffin borer at work, but it is only good to about 250 feet.

Cost of bore 700 feet long.

2727. What do you think it would cost the Government to put down a bore 700 feet and to case it? I cannot speak with any authority, but I should say about £3 per foot.

Test bores.

2728. Have the pastoral lessees in your district asked the Government to put down test bores? I do not think so.

Supply from wells.

2729. I suppose that in time of drought you look upon the wells as the only reliable source of supply of water? Certainly they are the most reliable, but I do not think that a well is as valuable as a good tank.

2730. Have you heard of any instances of the water flowing over the surface from wells sunk in your district? No.

Artesian supply.

2731. Do you think that if a bore were put down 1,000 or 2,000 feet, that an artesian supply would be found? I do.

Silt in Lachlan River.

2732. *Mr. Gipps.*] Does the Lachlan River bring down much silt? No.

Weir across the Lachlan.

2733. *President.*] Is there any more information which you can give us? I think that it is important that a weir should be put across the Lachlan; it would provide water for almost as much country as the Lachlan does in its course from where the Willandra outlets to its junction with the Murrumbidgee. That country is practically useless now in dry seasons.

Wells between Mossgiel and Wilcannia.

2734. *Mr. Franklin.*] Do you know whether the wells on the stock route between Mossgiel and Wilcannia contain a permanent supply of water? They do, but the water is very salt.

Well at Jumping Sand Hill.

2735. Do you know the well at Jumping Sand Hill? Yes; it is a good well as far as a supply of water is concerned. Sheep will drink the water, but horses and cattle do not care about it. A 20,000-yard tank would be much more useful there.

Lakes below Oxley.

2736. Do you know whether the lakes into which a diversion has been made from the Lachlan, below Oxley, contain permanent water? I think that they are dry at the present time.

Diversion into the Willandra.

2737. *President.*] Suppose a weir were to be thrown across the Lachlan to divert water down the Willandra, do you think that the work ought to be undertaken by the Government, or by the inhabitants—they borrowing the money from the Government and guaranteeing the payment of principal and interest? The country being Crown Land, which is open to selection, I think that the Government ought to do the work. They might demand a contribution from the men on the frontages.

Local Trust.

2738. Do you think that the work ought to be done under the direction of the Government or of a local body? I think that a local body would be the best.

Rate.

2739. *Mr. Murray.*] Do you think that the pastoral lessees or others who would be benefited by the work would submit to a tax which would cover the interest on the money expended? I think that they would be only too glad to do so. I think that the men on the Willandra proper would pay nearly the whole of the cost of a weir, if the Government would ensure them against the weir being damaged by other people.

Mr. Alexander M'Queen called in and examined:—

M. A. M'Queen. 4 Dec., 1884.

2740. *President.*] Where do you reside? At Nap Nap, on the Murrumbidgee, 45 miles below Hay.

2741. Have you been there for any length of time? Six years.

2742. Has Nap Nap a frontage to the Murrumbidgee? Yes.

Flow in Murrumbidgee River.

2743. Is there always a good stream of water running down the river? It has been very low this year; there are some places where a man might have stepped across the river this season.

Bed of the river.

2744. What is the nature of the bed of the river? Stiff marly clay.

2745. Is it not sandy? No, there is not much sand in our part of the river.

Depth of water.

2746. What depth of water has there been running down the river this year? I do not suppose that at any time there has been more than 7 or 8 feet.

Width.

2747. By what width? Perhaps 50 or 60 yards.

2748. But you said just now that a man might step across it? That is where there are logs. I do not think that the water would reach more than half-way to a man's knees in crossing at any of the fords.

Diversion into the Yanko.

2749. I suppose that you have heard that a proposal has been made to divert a portion of the water of the Murrumbidgee down the Yanko Creek? Yes. I think that if it were carried out, it would seriously affect the water below.

Injury to the country below.

2750. That is presuming that the water is taken when the river is low? The lower the water is taken from the river, the more will the country below be affected.

Widening of Yanko cutting.

2751 But do you think that any injury would be done to the country below if the water were taken when there was a good stream running down the river? The Yanko cutting might be widened, and by this means a large quantity of water might be stored at flood-time, but the cutting ought not to be lowered. You must bear in mind that the greater part of the Lower Murrumbidgee country depends upon being flooded.

Mr. A. M'Queen. 4 Dec., 1884.

2752. What effect has a flood on it? Very little grass grows until after the country has been flooded. I have about 80,000 acres of polygonum country there, and if a large quantity of water were diverted higher up, that country would be very much depreciated.

Diversion at flood-time.

2753. Suppose that water were diverted into the Yanko Creek at flood-time, do you think that a sufficient quantity would be taken away to materially affect the height of the flood in the river? It all depends upon the height at which the water is taken.

Protection by a sluice.

2754. Suppose a cutting were made into the Yanko, and were protected by a sluice, and only as much water taken off as was absolutely required, do you think that it would affect the flood-water below? I think that any cutting would be objectionable. From what I know of the people below, I do not think that they would object to the opening into the Yanko being widened at the present level, so that when there was an outflow in the river a larger quantity of water would go down, but the idea of making a cutting to let the water run into the Yanko would be very much objected to.

The present cutting.

2755. But there is a cutting there now? Yes, but that is very different from the one which it is proposed to make. We do not believe in the water being diverted at all. The country from Hay to the junction of the Murrumbidgee and the Murray is dependent on plenty of water going down the river.

Effect of a weir.

2756. Do you think that if a weir were put in the Murrumbidgee at Wagga or Narrandera, it would affect the water flowing below? I think so.

2757. Even supposing that the diversion of the water into the creek was regulated by a sluice, and was under the control of a responsible person? I think that any diversion of the water except at a certain height would be injurious to the lower part of the river.

Level of diversion.

2758. What height would you suggest? The river must be 20 feet above summer level at Wagga before it will flood our country and fill up the lakes and lagoons.

2759. You would not like the water to be run into the ana-branches at a lower height than 20 feet? I should not like the water to be taken at a lower level unless there happened to be two good floods in one season, when the people higher up could take as much as they pleased.

2760. You would object to the water being interfered with in the first flood? Very much so.

Wells.

2761. Have you any wells on your run? Yes.

Depth.

2762. What are the depths? From 100 to 150 feet.

Quality of water.

2763. Is the water good as a rule? It is fairly good water for stock, except in one well.

Rise in shafts.

2764. Does the water rise in the shafts? There is plenty of it.

Source.

2765. Have you any idea as to the source of the water? It is usually found in beds of lignum, and I think that the source of it is the Murrumbidgee higher up, and that the water runs down an old channel.

Tanks.

2766. Have you any tanks? A large number.

Position.

2767. Where do you usually construct them? On hard ground where there is a good catchment area. The country is very level, and we generally select the base of an eminence.

Depth.

2768. What depth do you usually make the tanks? Up to 12 feet.

Capacity.

2769. What capacity? Up to 10,000 or 12,000 yards.

Evaporation.

2770. Is there much evaporation? A great deal.

2771. Have you made any tests to ascertain the amount of evaporation? No, but I have noticed that the water disappears more quickly in dry hot windy weather than it does at other times.

Dams.

2772. Have you any dams in the ana-branches? I have some on creeks into which the water flows at flood-times.

Overshot dams.

2773. Are they overshot dams? They are overflow dams.

2774. When the water rises to a certain height it flows over and runs into the next dam? Yes. Some of the creeks are not dammed because the people lower down would object to dams being made in them.

Objections.

2775. Suppose that you constructed overshot dams in those creeks, do you think that any objection would be raised to them? I think so. Some of the creeks terminate in large water-holes, and the water spreads over the plain. We make the best use of these natural features for the storage of water. Where the creeks have a continuous course the people object to dams being made.

Height of creeks.

2776. What is the height of the creeks above the ordinary level of the Murrumbidgee? I think that a survey which has been made of the Murrumbidgee shows that the fall of the river from Hay downwards is about 8 inches to the mile.

Straightened length of the river.

2777. *Mr. Franklin.*] What would be the difference in the length supposing that the river were to run straight, and the length of the river with all its sinuosities? About three times.

2778. So that a straight cut would increase the fall three times? I suppose so.

2779. Does the country fall at right angles to the river? It rises slightly on both sides of the river.

2780. Have you made any comparison of the ordinary level of the river and the level of the most depressed portion of your run away from the river? No.

Banks.

2781. *President.*] What is the height of the ana-branches above the summer level? As you go towards Balranald the banks get lower and that country gets flooded first. The further up you go, the higher the flood outlets are.

Height of flood outlets.

2782. What is the approximate height? Quite 15 feet, if not more.

Weirs.

2783. Do you know of any place on the river where a 3 or 4 feet weir would divert the water over a large extent of country? Not on the upper part of the river; on the lower part such weirs might be of some use.

Utilization of the flood-water.

2784. Do not you think it advisable that some means should be adopted to utilize the large quantity of water which runs to waste? It all depends on how it is to be utilized. The country on the lower part of the river must be flooded, to be of any use.

Canals.

2785. I am referring to flood-waters? Canals to carry the flood-water further inland would be of great value.

Government and Local Trusts.

2786. Do you think that such works should be undertaken by the Government or by local Trusts? I think that the Government ought to initiate the works or provide the means, and then allow local bodies to decide in what directions the canals should be made.

Navigation.

2787. *Mr. Franklin.*] Do you think that the maintenance of the navigation of the river (say) to Hay, is of greater consequence to the holders of property than the regulation of the flood-waters? The navigation of the river is of great importance to all the station-holders below Hay. It would require a great deal of consideration to determine which of the two things is the most important. The distribution of the flood-water would be of immense advantage, and I think that it might be regulated without in any way interfering with the navigation. It would be a bad thing for the district if the navigation were interfered with.

Mr. A. M'Queen. 4 Dec., 1884.

2788. We find that there is an enormous volume of water carried away by the Murrumbidgee, which is simply wasted, in order to keep up a certain level for navigation only to a point as far as Hay: would it not be of greater benefit to the district to conserve that water than to provide for the navigation? That is a very difficult question to answer—I should not like to express an opinion.

Velocity.

2789. Could you supply us with a monthly statement showing the velocity of the river at your place? Yes; I shall be most happy to supply the Commission with any information which it is in my power to supply.

Depth.

2790. *Mr. Murray.*] What is the depth of the river at your place at the present time? Up to 4 feet.

Waste of water.

2791. Does not a large quantity of water go past your place to waste? Occasionally, but there has been no waste water during the last two or three years.

2792. I suppose that in flood-time only a small proportion of the water is required to fill the tanks which you speak of? Yes; a vast quantity of water goes to waste in flood-time. This is the water which ought to be stored.

Effect of weirs.

2793. Could not the water be raised by weirs to answer the same purpose as floods? Yes, on the lower part of the river, but it would be useless on the upper part, as the tanks are too high.

2794. *Mr. Gipps.*] What is the value of the river traffic at Hay? I have no idea.

Pumping water into canals.

2795. Suppose that the river were raised by a movable weir 10 feet, could not sufficient motive power be got out of it to pump up a large supply of water? I know that some years ago Mr. C. B. Fisher had an idea of that kind—he thought that he might be able to pump water into canals several miles back from the river. Such an undertaking is quite feasible, but I do not know whether it would be profitable. So long as the river flows we can run the stock 6 miles out, and the water would have to be conveyed beyond that to be of any use.

Low state of the river.

2796. *President.*] Have you ever known the Murrumbidgee to be so low that there was a danger of the supply of water for stock running short? I have not, but I have heard of it. There has always been a stream in the river since I have been in the district, and I believe that the river was lower last spring than it has been for twenty-five years.

Mr. James Tyson called in and examined:—

Mr. J. Tyson. 4 Dec., 1884.

2797. *President.*] You have a number of stations in Queensland and in New South Wales? Yes.

2798. Have you any stations on the banks of the Murrumbidgee? Yes.

2799. Is the Murrumbidgee as low this year as you have ever seen it? No, it is not low at all.

Low state of the Murrumbidgee.

2800. How many years is it since you knew the river to be lower than it is now? I remember three occasions when I have seen the river dry; in 1841 you could walk along the bed of it for 5 or 6 miles in places.

2801. How many years since? In 1841, and the last time in 1852; the other time was between those years.

2802. In what part of the river? At Groongal, near Hay.

River bed.

2803. Is the bed of the river sandy or hard? The bed is generally clay, with sand in the angles.

Dry river.

2804. And I suppose although the river was dry on these occasions, there was water in the bends? Yes.

2805. But there was no running stream? For miles there was no stream. In 1841 you could walk on the bed of the river for 5 or 6 miles.

Influence of stocking.

2806. Do you think that the stocking of the country since that period has caused a larger flow of water? Yes.

Filling up of the river.

2807. Then it is hardly likely that the state of things which you have described will exist again? The flow into the river is far greater than it used to be; but at the same time I notice that the river is filling up gradually. At one time there used to be large waterholes in the river, but these are all being filled up with silt now, and the river is a continuous stream. I think that this silt is washed in from the surface, which has been broken by stock grazing on it.

Mud

2808. Is that silt, sand, or mud? Mud generally; in some places it may be sand. Where the holes are filled with mud, they will not absorb water as they will where they are filled with sand.

Diversion into the Yanko.

2809. I suppose that you have heard of the proposal to divert a portion of the water in the river down the Yanko? I did not hear of it until just now.

Yanko cutting.

2810. Are you aware that some years ago a cutting was made into Yanko Creek for the purpose of diverting a portion of the flood-water in the river? I have seen the cutting.

Its effect further down.

2811. Do you think that it has in any way interfered with the flow of water further down? Not in flood-time. An overshot dam in the river at the entrance to the cutting would throw a great quantity of water into the cutting; and taking all the surroundings into consideration, I think that perhaps it would be wise in the interests of the country to put a shallow dam there, so that when there was a flood, a large quantity of water might be forced into the cutting.

Overshot dam.

2812. By doing that, you do not think that the people lower down would be injured? Not when there was a high flood.

Firm ground.

2813. Do you think that if such a channel were made, it would be wise to leave it unprotected? There is no fear of any wear or tear in a cutting there, because the ground is very firm. It is where the sides of a cutting get undermined by the water that the mischief is done.

2814. You do not think that there would be any danger of earth from the cutting being washed into the river? No

Danger to banks.

2815. Suppose that the inlet to the creek were inclined and the earth taken away, do you think there would be any danger of the banks being undermined? I do not think so, as the work would not dam a sufficient quantity of water to do any damage or to enlarge the creek all the way along—it might do so to a slight extent at the inlet. My idea is that where the channel is narrow it should be widened—all obstructions should be removed, so that when there was a flood in the river there would be a big gush of water down the channel. Let it be understood that I recommend that a dam should be made in the river only to force the water down the cutting while the flood lasted. It would have to be understood that the water should not be used for irrigation, but simply for the purpose of making provision for a supply for stock in dry seasons.

Widening of the channel.

Water supply for stock.

Sluice.

2816. Do not you think that, to prevent the people wasting the water, it would be a good thing to have a sluice under the control of a responsible person? That would be a judicious and useful plan, as the water could be shut off when a sufficient supply had been sent down.

Height of weir.

2817. You do not think that an overshot dam in the river would interfere materially with the flow of water down the river? That would depend on the height of the weir.

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2818. What do you say about a weir 3 feet high? It would not do any harm when the river was high.

2819. Do you consider that the navigation of the river from Hay upwards is of any material importance? Not at all, considering that there is a railway to Hay.

Navigation.

2820. Is it of such importance that it ought to be allowed to stand in the way of the construction of a weir such as we have been speaking of? I do not think that under any circumstances there would ever be a great deal of navigation between Hay and Wagga. The stream is full of snags and overhanging timber, and altogether it is uncertain.

2821. What is your opinion as to the navigation between Hay and Balranald? The river is shallow at Gelan, 30 miles below Hay.

Effect of weir on inundation.

2822. Do you think that the construction of a weir at the inlet to the Yanko cutting, to intercept a portion of the flood-water, would lessen the inundation of the country lower down? It would. I am dependent in a large measure on floods—I should be starved off the country if it were not for flood-water. I may explain that the supply to the Yanko from the Murrumbidgee is dependent solely on the duration of the floods; it takes days and weeks before the water will run through. As illustrating the extent of absorption in some places, I may state that at Juanbung, above the junction of the Lachlan and the Murrumbidgee, you will see the water running into a creek for three weeks at a time, and all of a sudden the water disappears in a large fissure on the surface. You can hear the water rushing into the fissure a quarter of a mile away. By-and-by you will find that the water comes out half a mile away. After the water has been running for some time, if you ride over the ground underneath which the water passes, your horse will sink into it.

Large fissure.

Local supply in Yanko country.

2823. Is there anything further that you would like to say respecting the Yanko cutting? They ought to get a large local supply in the Yanko country, because it is such good holding ground there. I know that, in consequence of the levelness of the country, the water which may be run into the cutting is likely to back into the river unless the rise is of long duration or you put a dam at the inlet.

2824. Suppose that the water were diverted at half flood or full flood, for the purpose of enabling the people in the Yanko country to fill their dams and tanks, do you think that it would be seriously objected to, or that it would seriously affect the flow of water further down? I can hardly answer that question. Any water-holes which the people might make would not materially affect the flow in the river, but if they were to make a cutting into the back country and let a large quantity of water run on to the low land, that would affect it.

2825. Your experience extends over the whole Colony? Yes.

Holding nature of ground

2826. What is your experience of the country in the north of New South Wales, that is with reference to the holding nature of the ground? In some places it is good, and in other places bad; you cannot lay down any rule which will apply alike to all parts of the Colony. Everything is governed by local circumstances, and in dealing with the important question which you have in hand you must give full consideration to those local circumstances.

The Darling.

2827. Do you know much about the tributaries at the head of the Darling? I am familiar with the Darling from its source to its outflow, and with all its tributaries.

Places for impounding water.

2828. Do you know of any places at the heads of the river where it would be possible to impound any large quantity of water which could be run off and utilized in dry seasons? On the tributaries of the Darling there is good holding ground—there being abundance of grass which binds the soil—and I think that it would be quite possible to construct dams which would not be detrimental to the interests of the lower country; but this doctrine will not hold good in the lower part of the country, because you must remember that the country west of the dividing range is an inclined plane, and that the fall is much greater at the commencement of the plane than it is further, and ultimately it becomes almost a dead level.

Natural gorges.

2829. Do you know of any natural gorges across which dams might be constructed which would impound any large quantity of water? I cannot think of any such places at present. If it can be done—and I think that it can—it will be a great advantage, because the water will be under control. If you wish to impound any large quantity of water you must do it before the river reaches the level country—you must do it on the high land separating the watersheds of the rivers.

Weirs across the Lower Darling.

2830. Do you think that any good would be done by putting weirs across the Lower Darling? No, because it is not high enough, and besides the ground is too absorbent to enable you to get the water away. The ground is like ashes, and if you make an ana-branch the chances are that it will become the main channel in the course of time. If you were to put in a weir it would cause the river to silt up. The country is entirely different from the Yanko country.

Sluices.

2831. Do not you think that the cuttings into the Darling might be protected by sluices? No, because the action of the water would enlarge the cutting outside of the sluices, and then channels would be formed around the sluices, which would become quite useless. There is no stone or suitable material of any kind to enable you to make a good job of any such work.

Absence of building material.

Movable sluice.

2832. *Mr. Gipps.*] But suppose that we had a movable sluice, which would be raised when the river was low? It is all right in the river, but the difficulty is when you let the water go abroad. I have tried it myself many times. I know of places on the river where, if you were to put a dam across, the river in those parts would become dry and a new channel be formed, perhaps flowing 100 miles away. The land is usually higher on the banks of the river than it is anywhere else.

Dry lakes.

Dam across the Lachlan.

2833. *President.*] I suppose that there are many places where by diverting the water the dry lakes could be filled up? Yes; if a dam were made across the Lachlan below the Willandra Billabong, and other dams below that, the water would be turned across into the Darling.

Wells.

Salt water.

2834. Have you sunk many wells on your station on the Lachlan? Yes, but I got salt water in all of them. None of the wells is more than 80 feet deep, and the water is as salt as the sea. I may tell you that I have made several cuttings from the back-waters which has filled up a number of lakes, in some of which I have a supply of water for years to come. In one of these lakes the water is 50 feet deep. This cutting is from 1 to 6 miles long. I am making another cutting from Waljeirs, which will be about 20 miles in length. I make use of the natural depressions so far as they follow the course which the cutting is to take, and I excavate a canal in the ground between the depressions. Where I am making the cutting it is 30 feet wide, and from 4 to 7 feet in depth. I made another cutting between Lake Bonarey and the Merowie Creek; the lake was filled, and the water lasted for seven years, but during the last three years there has been no water in the lake.

Supply in lakes.

Canal connecting natural depressions.

2835. I suppose that the 20-mile cutting which you are making will divert nothing but flood-water? I only wish to intercept the flood-water.

Mr. Evan Evans called in and examined :—

Mr. E. Evans. 4 Dec., 1884.

2836. *President.*] Your residence is —? Roto, Lachlan District, near Hillston.

2837. What is the nature of the country? It is level country principally.

Wells. 2838. Have you done much in the way of searching for water by sinking wells? We have sunk several wells.

Depth to water. 2839. To what depth do you generally sink before you strike water? Our best wells are from 120 to 170 feet deep. The wells at about 120 feet are the best.

2840. Do I understand you to say that the shallow wells are the best? Yes.

Good water. 2841. Is it good fresh water? Yes, we have very good water; that in the wells at 120 feet deep is perfectly fresh. We have a couple of wells at 165 feet deep, in which the water is slightly sweet.

2842. Can you use that water for stock? Yes, it is fit for any purpose.

Rise in shaft. 2843. To what height does the water rise in the shaft? Very little—only about 8 feet; but there seems to be a very strong supply.

Supply. 2844. What number of sheep can you water at a single well? We could water as many sheep as you could bring to any of our wells.

2845. Have you any difficulty in lowering the water? Sometimes we have to work the whims extra fast to reduce the water to make repairs, but we find that we cannot get it down very low. In hauling the water for stock we could not reduce it; you might water 20,000 sheep at one well and you could not reduce the water.

Quality of water. 2846. Have you any wells in which the water is so salt that you cannot use it? No; the water is generally good—when we get it. There are one or two wells in which the supply is not very great, and we have sunk shafts 300 feet without getting water.

2847. Did you pass through any rock? No.

Nature of strata. 2848. What is the nature of the strata? A white clay; when we get through that, we come into sand drift in which we find the water.

2849. Is there a division between the fresh water you get at a shallow depth and the salt water? There is no apparent connection between the two supplies.

Tanks. 2850. Have you any tanks? Yes.

Size. 2851. Of what size? 10,000 yards.

Depth. 2852. Of what depth? About 16 feet.

Permanency of supply. 2853. Do you consider a 16-feet tank a permanent one? That all depends upon the catchment area. If you have a good drainage area into a 10,000-yard tank you will never see the bottom of it.

Silt tanks. 2854. Do you construct silt tanks? Yes, we always make a small tank of 2,000 yards to catch the silt.

Banks. 2855. Have you any tanks with banks around them into which you pump water above the ordinary surface level when there has been a heavy rainfall? Yes; we usually make our tanks in depressions on the surface.

2856. Do you consider that tanks are better than wells for stock purposes? I think so—where you make the tanks in good sites.

Distance from the Lachlan. 2857. How far is Roto from the Lachlan? The nearest point is about 15 miles.

Source of well water. 2858. Have you any idea of the source of the water in your wells? Certainly it is not connected with the river, because the depth is too great for that.

2859. Do you think it is simply surface water which gets away in flood-time, or does it come from any distance? I think that it must come from a great distance.

2860. If it came from a great distance would it not be artesian? We have never put down the bores sufficiently deep to test that; we are satisfied if we get a good supply.

Willandra Creek. 2861. Are there any ana-branches or billabongs running out of the Lachlan? There is the Willandra Creek.

Diversion of Lachlan waters. 2862. Do you think it would be advisable, in the interests of the people there, to attempt to deepen the channel into the Wallandra Creek and throw a portion of the Lachlan water into it? That has been done already—there are two cuttings into the Wallandra.

Willandra cuttings. 2863. Are they sufficiently large to divert any considerable quantity of water? When the river is running nearly a banker the water runs through the cuttings in the Willandra. The country is very level, and it would require a very deep cutting indeed to cause the water to run down the Willandra from summer level.

Direction of fall of country. 2864. In which direction does the country fall when you go out some distance along the Willandra? West.

Discharge of Willandra into the Murray. 2865. If the stream on the Willandra continued to run, would it go towards the Darling or the Murrumbidgee? I think it has been discovered that it runs into the Lower Murray near Euston.

Merowie Creek. 2866. Do you know of any other dry creeks on the Lachlan into which water might be diverted? There is Merowie Creek, which has a long course, into which a cutting might be made from the Lachlan.

Diversion into all creeks. 2867. Do you think it would be practicable or desirable to divert the water in flood-time into all the dry creeks? Yes.

Enhanced value of land. 2868. Do you think it would materially increase the value of the land? Certainly, because it would give us a plentiful supply of water.

Government and local Trusts. 2869. Do you think that any work of the kind ought to be undertaken by the Government, or by local Trusts, who would borrow the money from the Government and repay the principal and interest in the course of a term of years? I have not studied that question sufficiently well to justify me in giving an answer. If the squatters only had a tenure when they had the country, they could have done the work themselves in the same way as they made cuttings into the Willandra.

Origin of salt-water. 2870. Have you any theory as to the cause of there being salt water in the interior? I think there is a deposit of salt in the ground, because I find that after the wells have been freely worked for some time they become very much fresher, thus showing that there must be an exhaustion of minerals.

2871. Have you any wells where the salt water is above the fresh water? No.

Willandra cutting. 2872. Has water run into the Willandra through the cuttings from the Lachlan? Owing to the drought, the Lachlan has not been a banker for five years in these parts.

2873. Do you think it would be a wise thing to deepen the cuttings? I do.

2874. Could it be done without interfering with the flow of water further down? If the cuttings were deepened so that the water would run when the river was half a banker, there would be any quantity of water

Mr. E. Evans. 4 Dec., 1884.

water for the people lower down. After the dams were filled the water would have a tendency to go back to the river—(this would occur only in very high floods such as that of 1870)—so that the people below would not be deprived of their supply.

Dams.

2875. Are there any dams on the Willandra Creek? Yes.

2876. Are they overshot dams? No, they are all dams with high embankments, but they are situated so that the surplus water finds its way through a natural by-wash into the creek. Where there are two channels, one lower than the other, we dam the lowest. As far as I am concerned, I know that there has been no diversion of water from the creek.

Permanent supply.

2877. To make the supply in the dams permanent I suppose you would require a supply down the creek each year? Yes, the dams will not retain the water more than a year; my dams have not received any water from the river for four years—it is only when there has been a local thunder-storm that any water has run into them.

FRIDAY, 12 *DECEMBER*, 1884.

Present:—

MR. BARTON, M.P., | MR. GIPPS, C.E.,
MR. DONKIN, J.P., | MR. LYNE, M.P.,
MR. M'MORDIE, B.E., C.E.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. James Tyson further examined:—

Mr. J. Tyson. 12 Dec., 1884.

2878. *President.*] You produce a map of your station at the junction of the Lachlan and the Murrumbidgee Rivers (*Appendix* R)? Yes.

Juanbung station.

2879. What is the name of the station? Juanbung.

2880. You stated in your evidence the other day that you had made extensive cuttings to take water into the back country? Yes.

Cuttings to Lake Kerrish.

2881. Would you point out the cuttings as shown on the map? Yes. The first cutting is ¾ of a mile long, from the Murrumbidgee flooded country into lake Kerrish. The flooded country is about 12 miles from the river. The cutting is from 18 inches to 4 feet deep; it is 15 feet wide, and has a batter of 18 inches to the foot.

Fall of country.

2882. What is the fall from the flooded country into the lake? The lake is surrounded by a sand-hill, and when that is cut through the fall is very great—about 2 feet to the chain.

Fall of cutting.

2883. What is the fall of the cutting all the way through? At some remote period water ran into the lake through creeks, and in forming the connecting channel I have made use of portions of the old creeks which have not been filled up. The fall from the flooded country into the bed of the lake would be about 30 feet. The next cutting is into Bunumbur Lake. It takes the flood-waters of the Lachlan and the Murrumbidgee into the lake. The cutting is about 5 miles long; it is 8 feet wide, from 2½ to 5 feet deep, and has a slope of 3 to 1. The lake is about 10 miles from the Murrumbidgee, and 5 from the Lachlan.

Cutting to Bunumbur Lake.

Box country.

2884. Is that lygnum country? No; it is flooded box country; there is lygnum in some places. The next cutting is into Boochatam Lake. The cutting is from the Lachlan flooded country. It is from 4½ to 5 miles long, from 2 to 5 feet deep, 12 feet wide at the bottom, and has a slope of 3 to 1. The next cutting is from the Lachlan River into Comayjong Lake, and from that Lake into Box or Merowie Creek. The cutting is about 7 miles in length from the Lachlan; it is from 4 to 16 feet deep, 10 feet wide at the bottom, and has a slope of 1½ to 1. The cost of the cutting was £14,000.

Boochatam Lake.

Comayjong Lake.

Cost of cutting.

2885. How far down the Merowie Creek is the water conveyed? 50 or 60 miles.

Outrun of the water.

2886. Where does it go to then? It runs into open swamps.

2887. Does it not run into the Murrumbidgee? If there is a general overflow of water it runs into Lake Waldare. At ordinary times it goes into quagmires for scores of miles. The next cutting is on the east side of the run, within 5 miles of the boundary between Juanbung and Walgiers runs. A portion of the cutting was made about thirteen years ago, and it filled Lake Bungarie. The water which ran into the lake at that time lasted for eight or ten years. The cutting was about 2¼ miles long. The area of the lake is about 1¼ mile by 1 mile, and about 20 feet deep. The size of the cutting is 20 feet wide at the bottom by 5½ feet in depth, the slope being 3 to 1. This 5½ miles must be added to the 2¼ first made, giving a total of 7¾, besides from 12 to 16 miles of cutting and damming through flooded country on the Walgar Run, leading the water in a continuous stream towards Lake Bungarie.

Lake Bungarie.

Area of lakes.

2888. What is the area of the other lakes? Comayjong is about 1½ mile by 1 mile. It is a shallow lake, only about 8 feet deep. The area of Boochatam Lake when full is 4 miles by from 1 mile to 1¼, and from 30 to 50 feet deep. Bunumbur Lake is about 1½ mile by 1 mile, and 18 feet deep. The area of Kerrish Lake is 1½ mile by 1 mile, and the depth about 20 feet.

Stock watering from Lake Bungarie.

2889. Did you water your stock at Lake Bungarie for eight or ten years? Yes—a large number of stock. The lake watered four paddocks without any assistant supply except such as was collected during thunder-storms. No water has run into the lake from the river except on the occasion to which I refer. Two of the paddocks are 8 miles by 5, and the others 10 miles by 5.

Carrying capacity of the run.

2890. What would be the difference in the carrying capacity of the run without these improvements, and with them? It would be vast, as the cutting is into the sole of the run, and there is water all around that—the river frontage is nothing compared with that. In an unimproved state the eastern part of my station in which this lake is situated would not carry more than 20,000 sheep; there are now on it 50,000 sheep; I have had more than that number of sheep on it. The other part of the run is uncertain, as it depends on flood-water. The Murrumbidgee throws water about 12 miles up the Lachlan channel and irrigates the intervening country. When the waters of the two rivers meet, there is a general overflow and the country is flooded for a considerable distance. When you get down the Lachlan you cannot find any regular channel into the Murrumbidgee—there is a series of small channels. There is not sufficient current for the waters to form a defined channel. The whole country becomes inundated, and in good seasons it is fine country, but without being irrigated by floods it will not keep many stock. The only lakes which have water in them at the present time are Bungarie and Bunumbur. Without the lakes the run would not carry more than 20,000 sheep, but at present it would keep between 40,000 and 50,000 sheep.

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2891. Is that in a bad season? In an ordinary season.
2892. What is the acreage of the first part of the run which you have described? Twenty miles by 20, or about 256,000 acres. Area.
2893. What is the area of the other part of the run which you have described—the part which you say is uncertain? About 400 square miles. I pay £500 a year rent on this run on which, without the improvements which I have made, there would not be a drop of water, and the only portion of it which would be available for stock would be that which is contiguous to the rivers.
2894. What is the total area of your run? Juanbung back run is 400 square miles; Sahara and Sahara North, 100 square miles each; Sahara No. 2, 60 square miles; Cooncombera, 70 square miles; Toorong, 50 square miles; Juanbung proper, 30; or about 810 square miles in all.
2895. And you say that country will carry only from 40,000 to 50,000 sheep? I do not know where you could pack them to make it carry more. It is waterless country. I have had tanks there without water in them for the last five years. Waterless country.
2896. How many wells have you on this run? Over ten have been dug, but there was salt water in them all. Wells.
2897. How many tanks are there? I could not give the exact number; I believe there are nearly thirty. Tanks.
2898. And there is not a drop of water in them? Not a drop.
2899. What area do they represent? It is marked on the map in each case.
2900. Have you any other runs mapped out and showing similar works conveying water from rivers? I have no other runs upon which so much work has been done. I have been in occupation of this run since July, 1846. Works on other runs.
2901. Have you carried out similar work on any other rivers? I have not.
2902. Do you think that weirs placed on the Darling at suitable places would stand? I do not think they would. Weirs on the Darling.
2903. Can you give us your reasons for thinking so? Readily. It appears to me that a large portion of the Riverina was at one time a lake; which evidently broke out at the Mallee Cliffs on the Lower Murray, between Euston and Wentworth. I speak generally of the water systems of the Murray, the Murrumbidgee, the Lachlan, the Darling, and the Warrego. These rivers run down an inclined plane westerly; but the fall is gradually lost and a dead level is almost eventually reached. This appears to me to have been the bed of the lake. The earth in the neighbourhood of the rivers is a sort of silt; there is no clay—it is a deposit; you could not make bricks out of it; it is vegetable matter that has been in solution. When the rivers run down into the neighbourhood of the low country there is an overflow, and as they get down lower a general inundation. The rivers mingle with one another. If there is a heavy flood, and the Murray comes down first she discharges her water into the Murrumbidgee, and if the Murrumbidgee comes down first she will discharge her water into the Murray near their junctions. Riverina a former lake. Nature of deposit. Floods. The rivers discharging mutually one into the other.
2904. And the same with the Lachlan and Darling? Precisely the same. The water will flow from the river which is highest into the river which is lowest or its next neighbour. This country being composed of silt, I think you could not make a dam which would stand. The country is a perfect quagmire in flood-time. If you were to make a dam, the water would run out and make a course in another direction. Country composed of silt. Dams.
2905. You think it would wash out? Yes; you have nothing to hold it. From the nature of the country, it becomes generally inundated; it is inundated at times 20 miles wide.
2906. Do you think it would be possible to keep the channel clear by removing the silt, and to prevent the bywash by giving the protection of a sluice? The sluice and all would go. Anything you did would be affected by the flood. I have been living in the neighbourhood of the Murray and its waters ever since I was nineteen, and I know of nothing which you could do. When you find the river bank high at any one place, such as Wilcannia, it is low on the other side. I should regard the construction of weirs in this part of the country as a perfect waste of money. If you turn the river out of its natural channel you have a difficulty before you; you can fill up the channel, but then you must make provision for the outflow, and how are you to do that? Removal of silt. Effect of floods.
2907. *Mr. Donkin.*] Then you think it impossible to weir the Darling or the Lower River Murrumbidgee? I do. These rivers, however, run out of country which is fit for cultivation—country in which clay is to be found, and in which weirs or cuttings could be made. Weirs on the Darling and Lower Murrumbidgee.
2908. Could you say approximately what is the northern boundary of the lake to which you refer? It ran through all the Colonies—at least that is my impression. The Barrier Range, I think, divides the waters of the Darling from those of Cooper's Creek. Northern boundary of the Riverina lake.
2909. *President.*] And the dip would come in from South Australia at the Bight? There is a dip on South Australia at Lake Eyre. The low country extends southerly and westerly into Victoria. There is more or less a border of mallee on the right, and on the left you have the western slopes of the main range as you look south. Dip.
2910. *Mr. Donkin.*] Have you been at Brewarrina—you know there is a natural weir there? Yes. Weir at Brewarrina.
2911. There is a fall of 4 feet—how does that weir stand? That is in accordance with what I have endeavoured to describe—it is a stone reef across the river. Here is a great elevation between the eastern and western waters. Going westerly the greater part of the elevation is lost in the first 100 or 200 miles; within that distance the country is firm, and is more or less fit for cultivation.
2912. Why does it not silt up at Brewarrina? Because it is high, and the water is swift.
2913. There is only a fall of about 8 inches to the mile? But it is solid ground. It seems to me that the water has been drawn out of an inland lake between the Gulf of Carpentaria and Spencer's Gulf. I believe that not so very long ago there was no Lower Murrumbidgee. If you examine the lower river closely you will see that there are evidences of newness as compared with the upper river. On the upper river there are trees 10 or 12 feet through; as you go down the river the trees grow smaller. The bed of the river is newer. There are roots in it, and I know of a place above Balranald where there is a tree standing in the middle of the river. Solid ground. Inland lake. Lower Murrumbidgee.
2914. Might not that have been caused by the silting up of the river—a tree growing there? It might. I admit that the river might change its course and leave a tree standing on an island, as it were; but there are other evidences of the newness of the river. Newness of river.
2915. Do you not think that the scanty timber might be attributed to the want of natural facilities for its growth in this plain country? It would be an indication of the poverty of the soil. Higher up, however, the river is well formed; it is deep, and has every appearance of an aged river. Cause of scanty timber.

Mr. J. Tyson. 12 Dec., 1884.

2916. *Mr. Gipps.*] Is the flood-water thrown back on each side of the Murrumbidgee—north and south? Yes, on both sides. If you find high land on one side it is generally low on the other, especially on the lower part.

Flood deposits.

2917. Does every flood deposit silt? Yes, every flood carries with it a sluicing of earthy matter. This cream is as it were left on the first flooded country—it enriches it; as the water gets down towards Hay or thereabouts it is comparatively clear.

2918. *President.*] The solution which is deposited is as good as a coating of manure? Yes; it renders the country more or less fertile.

Mallee country.

2919. *Mr. Donkin.*] The rich country then would be the mallee country? No; you find it long before you get to the mallee country. The flats in the neighbourhood of Wagga are formed by these silt deposits. The eye has a great deal to do with education in these matters, and I think that a school should be established in the country by the State. Young men might be taught engineering there; they would obtain a practical acquaintance with the country; and what they saw near them would be of great assistance to them.

Establishment of a school.

Inclination of the country.

2920. *Mr. Gipps.*] As regards the deposition of this silt, does it seem to preserve the level character of the country, or does it seem to give the plain gradually an inclination from north to south, bringing the rivers down to a focus? The general tendency is from east to west. It varies at certain points.

Stability of weirs.

2921. As regards the weirs, you think that no stability could be obtained? The whole country is a quagmire in times of rain.

Depth of deposit.

2922. *Mr. M'Mordie.*] What is the depth of the deposit? Several feet.

2923. Is there firm ground underneath that? As far as I am aware there is no firm ground. I do not know how it would be possible for you to carry out any works there.

Movable weirs.

2924. *Mr. Gipps.*] Suppose you constructed a movable weir, which in flood-time would offer no obstruction? I do not believe in movable weirs.

Worst part of country.

2925. *Mr. Donkin.*] Where is the worst part of this flooded country on the Darling? From the junction of the Warrego downwards—especially when you get down below Wilcannia.

Mr. John Clark Bowden called in and examined:—

Mr. J. C. Bowden. 12 Dec., 1884.

2926. *President.*] Your residence is at—? Balranald.

2927. Have you lived there for any length of time? Eleven years.

2928. Have you had any general experience of that part of the country; Yes; of the Murrumbidgee, the Lachlan country, and the Darling country, as far as Wilcannia.

Diversion into dry creeks, &c., of the Darling.

2929. Are you of opinion that any large quantity of flood-water could be utilized by being diverted into dry creeks and ana-branches of the Darling, without interfering with the general flow of the river? The Darling is the most difficult of the rivers to treat, because the floods are irregular. When there has been no "fresh" for a considerable time, the river becomes a chain of waterholes.

Weirs.

2930. Suppose weirs were placed across the river at various points, to impound water and in flood-time to divert it into dry creeks, do you think that that could be done to any great extent without interfering with the flow of water below? I do not think that it could be done to any great extent.

Volume of water.

2931. Do not you think that there would be sufficient volume of water in flood-time? In flood-time there would be; but the river does not rise regularly, like the Murray and the Murrumbidgee. If the river rose annually what you suggest might be done.

2932. Of course it could be done when the river did rise? Yes, when the river rose above a certain point.

Darling country.

2933. The Darling country is very level? Yes.

2934. Suppose a weir were put across the river, to what distance back do you think it would throw water—say a weir 10 feet high? I could not give any reliable idea.

Scour.

2935. Suppose weirs are constructed, do you think that there would be much scour at the outlets? Yes, unless great precautions were taken.

Sluices.

2936. Unless they were protected by sluices? Yes, any ordinary cutting made on the rivers would widen very rapidly.

Stability of weirs.

2937. Do you think that it is possible to erect weirs in the river which would stand? That will be for a professional man to say.

Talyawalka Creek.

2938. Do the flood-waters of the Darling run down Talyawalka Creek? Yes, very rapidly—the banks of the creeks are very steep.

2939. Do you know at what height the water must be in the river before it will run into that creek? No.

2940. You have had experience of the Lower Murrumbidgee? Yes.

2941. As far as Narrandera? No.

Lygnum swamp country.

2942. Is it absolutely necessary that the lygnum swamp country on the Lower Murrumbidgee should be flooded to make it productive? Yes.

Weir on the Murrumbidgee.

2943. Do you think that a weir 4 feet above the summer level of the Murrumbidgee, at (say) Narrandera would interfere with the flood-waters? I think that a weir would be very objectionable at that level. If the water is to be diverted a much higher level ought to be named. Any diversion of water at the level you state would interfere with navigation in bad seasons—such seasons as we have had during the last three years.

Navigation.

2944. Has there been any navigation this season? It has been spasmodic as far as Hay.

2945. Can you explain in what way a weir 4 feet above summer level would interfere with navigation? Because it would prevent the water coming through unless it rose above that height.

Diversion into the Yanko.

2946. Suppose a weir were put on the river where the Yanko cutting is, and this were protected by a sluice so that the water would be diverted only when there was a surplus, do you think that it would seriously affect the flow of water further down? That would all depend upon the height at which you took the water from the river.

2947. What height would you suggest? We judge the state of the river from the heights of it at certain points—say at Wagga and Gundagai. When it reaches a certain point at these two places, we can judge with tolerable accuracy what extent of country will be flooded lower down. My opinion is that

Diversion level.

no water should be diverted from the river until it has reached a height of 15 or 20 feet at Wagga or Gundagai. If the water were diverted at a lower level it would seriously affect navigation and also the

runs

runs and the lower part of the river, which rely solely on flood-water to make a large portion of them available for stock. Mr. J. C. Bowden.

2948. Suppose a stream of water 4 feet deep by 10 feet wide were let into the Yanko cutting when the river was 4 or 5 feet above summer level, would that seriously affect the flow below? It would certainly make a great difference in the river. I judge that from experience which I had at Balranald through the breaking of a dam on a creek running into the Murrumbidgee. When the water ran into the lake a dam was made to keep it back. This dam broke and raised the water in the river to such an extent that it was quite noticeable. 12 Dec., 1884. Effect of diversion on the Murrumbidgee.

2949. Did the water run out of the lake into the river? Yes.

2950. How did the water get into the lake? It ran down the creek from the river in flood-time.

2951. *Mr. M'Mordie.*] What is the fall of the channel from the lake to the river? I do not know; but the river is very level there. The rise in the river between high-flood and summer level would be about 12 feet. High floods and summer levels.

2952. What is the length of the channel from the river to the lake? Between 2 and 3 miles.

2953. What is the size of the lake? It is about 8 miles in circumference.

2954. *Mr. Barton.*] Have you any runs in the district? No; I am in business at Balranald, Hay, and Echuca.

2955. You lay particular stress on the necessity for a large flow of water in the river for navigation? Yes; and also because of the effect which the flood-waters have on the low-lying lands between Hay and Balranald. Wants of navigation.

2956. You cannot offer a professional opinion as to the effect of taking a certain quantity of water from the river? No.

2957. You simply imagine that if a certain quantity of water is taken from above a certain level it will have a certain effect—you have no knowledge to guide you? Except the knowledge which I have formed by watching the rivers most carefully. The rivers are watched daily. Balranald depends on navigation because it is the port of a large area of country.

2958. What is the draught of vessels trading on the river? The loaded draught of some is from 6 feet to 6 feet 6 inches, but there are smaller vessels. Draught of vessels.

2959. What depth of water would there be in the river in the shallowest places at ordinary summer level? From 1 foot to 1 foot 6 inches. I have seen it year after year as low as that in numerous places. Shallowest depth of water.

2960. Does the river remain long at that level without any rise in dry seasons? From January until the end of May at Balranald, and much longer—probably two months—at Hay.

2961. Then in bad seasons the river is navigable for six months in the year? To Balranald for five or six months, and to Hay for a period of one or two months shorter. Season of navigation.

2962. Every year? Yes.

2963. Have you any idea as to what height the river has to rise before the low-lying lands would be benefited to any considerable extent? At Balranald, 13 feet, and at Hay about 16 feet. These rises would flood from the Lachlan Junction downwards. I have figures showing the effect of the rises in the rivers in various places. Effect of rise of the river.

2964. Can you supply us with a copy of these figures? Yes.

2965. Have you any idea as to the mileage of the flood at various heights? Yes; I can supply that with the other information.* Mileage of the floods.

2966. *Mr. M'Mordie.*] How often does the river rise to 15 or 20 feet above summer-level during an ordinary year? It rose regularly from 1873 till 1877. We have not had a beneficial flood for five years. Frequence of rise above 15 feet.

2967. So that according to your idea, no water ought to have been diverted during that time? Yes.

2968. Have you any idea of the quantity of water which would run to waste to the sea? No, but it must be very large.

THURSDAY, 8 JANUARY, 1885.

Present:—

MR. DONKIN, J.P., | MR. GIPPS, C.E.,
MR. FRANKLIN, C.E., | MR. LYNE, M.P.,

MR. McMORDIE, B.E., C.E.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. Charles Fartiere examined:—

2969. *President.*] Where do you live? I live at Marfield, near the 70-mile track, about 10 miles from "Hardy's Hotel," on Kilferra. Mr. C. Fartiere. 8 Jan., 1885.

2970. Is it near the road to Wilcannia? Yes, it is 10 miles north of the road.

2971. What is the area of the station? We are interested in two places; that one is between seven and eight hundred square miles.

2972. What kind of country is it? Scrub country. Nature of country.

2973. I mean the soil? It is sandy soil.

2974. Are there any claypans about it? There are cane-grass flats—not numerous, only scattered at long distances, quite sufficient for pastoral purposes, but not for cutting up into small areas.

2975. Have you improved the country much by making permanent water? Yes, we have made extensive improvements. Those improvements were commenced between three and four years ago, and they have been going on up to the present time. I can show large tanks of twelve and fifteen thousand yards that had never had a foot of water in them. To these tanks we have always put large drains—sometimes from 3 to 5 miles of drains. We have done all that we could to preserve water, and what I have stated has been the result. Improvements on the run. Tanks.

2976. Have you any tanks filled? At the present time I have only one tank on the run filled.

2977. What size is that? It is a 12,000 yards tank. Size.

2978. What is the general size of the tanks that you have made? From ten to twelve and fifteen thousand yards—generally from 10,000 to 12,000 yards. I find that tanks of a small capacity generally fail when they are most wanted.

2979.

* NOTE (*on revision*):—I regret I cannot furnish this information, as I have been unable to visit Balranald to obtain it.—J.C.B.

Mr. C. Fartiere. 8 Jan., 1885.

2979. How long do you consider that a 12,000 yards tank will last if there is a moderate quantity of stock on the run? I may mention that we make embankments round them. If we succeed in getting the tanks filled and embankments pumped up, we consider that they are good for a two years' supply for the number of stock that you can put on the country.

Capacity. 2980. How much water would a 12,000 yards tank hold? Approximately about 2,025,000 gallons, that is the contents of the excavation, when filled, irrespective of what can be retained in the embankments round the tank.

2981. How much difference will the embankment make? The embankment would increase the capacity of the tank by about one-third.

Evaporation. 2982. That would make it 16,000 yards? Yes; you cannot fill it to the top of the embankment—only half way. The increase is from one-third to one-half. Taking the evaporation into consideration, I should say one-third. There is a much larger evaporation when the water is above the surface, because it catches every breeze, and it goes much more quickly.

2983. You consider that it protects the lower water? It does decidedly.

Position of tanks. 2984. In what spots do you generally make your tank—in what kind of country? Always in the clay—in the hardest soil, in the cane-grass flats. If we are not able to get this country we go in for a larger amount of drainage, and we try and get into some natural depression in the soil.

Dry country. 2985. Have you any creeks running through Marfield? No, it is an entirely dry country; there is not a creek on it.

2986. You are entirely dependent on tanks and wells? Entirely.

2987. The country is not subject to floods at all? No, there is not a watercourse in it.

Nearest river. 2988. What distance off is the nearest river? About 90 miles.

2989. *Mr. Franklin.*] The nearest ana-branches? The nearest ana-branches will be about 70 miles distant.

Ana-branches. 2990. *President.*] Are there any dry ana-branches from the Darling coming near Marfield? No, they branch off lower down.

Central canal. 2991. Do you consider that it would be of great advantage if a central canal were brought down midway between the Lachlan and the Darling to convey water for filling those tanks at certain periods? I do not think that that would be practicable—we could never hope to get water by that means.

Objections. 2992. Why? I believe decidedly in a scheme of that kind being carried out, because according to my experience the larger amount of water that is conserved the greater is the rainfall. I do not think, however, that we could get a supply of water for our tanks by that means unless it was returned in the form of rain—the expense involved in bringing the water in small channels from the canal to the tanks would be too great. I think that the natural absorption of the soil would consume all the water that you could bring. I am a thorough believer in the idea of getting communication to the back country; it would be of great service as a means of transit for wool and supplies—it would materially lower the expense of working the stations.

Railways. 2993. That can be done by railways? Decidedly, if we get them.

2994. Of course you have been to the Darling? Yes, I have resided there. I am speaking now from twenty years' experience of the back country and fifteen years on the Darling.

The Darling. 2995. You know the stream of water running down the Darling? Yes; I travelled the Darling in 1868 and 1869, when it was looking as bad as it possibly could, and in 1870, when it was just at the other extreme.

Central canal. 2996. Do you not think it is practicable to bring down some of the waters of the Darling by a central canal? I do. I can show you the road that I travelled in 1870, and I know that then the waters of the Lachlan and the Darling were only a few miles apart.

Weirs and locks. 2997. But that was at a time when you did not want it? Yes, but if the water is conserved by means of weirs and locks we might have sufficient to bring it up to the requisite level.

Supply of tanks. 2998. I understood you to say that it was not possible to bring the water by a canal? I think you can bring the water down, but I doubt whether you can bring a sufficient supply for the tanks.

2999. Suppose it is practicable to bring the water down in the way I suggest, I suppose you will acknowledge that it is only a question of supply and demand as regards utilizing it in the tanks? Yes.

3000. If we can get a sufficient supply to fill the tanks, there is nothing to prevent it from being done? No; if you can get a sufficient supply of water it is practical enough, but that is what I doubt.

Flood waters. 3001. I should like you to point out on the map the route you took and the extent of the flood-waters in 1870? [*Witness indicated the route on the map.*] In 1870 I made a trip from Balranald to Pooncairie, and from Pooncairie to Wilcannia, taking a circuitous route through the whole country lying between Reed's Lake. those points. I was then acting as an appraiser. There is a lake in Monaro country called Reed's Lake that is not shown on the map. The lake was flooded in 1870 by the Darling River.

3002. How many miles is it from the bed of the Darling River? About 70 miles. Going from Balranald Lachlan water. near to Pooncairie I had to swim a strong running stream which came from the Lachlan. It must be between 40 and 50 miles from the river. I have gone over the country several times since then. I am Flow to the Murray. sure that there has been in past times a flow of water from the Lachlan to the Murray. At the time of which I speak the water would have found its way into the Murray if it had not been blocked by sand-hills a little higher up.

3003. Do you consider that the stream which you crossed was water which had flowed out of the Lachlan Willandra River. through the Willandra River and found its way down towards the Murray? Yes. If it had been Lake Golgol. assisted a little it would have found its way into the Murray at Lake Golgol, about 20 miles higher up the Murray River than the junction of the Darling and Murray Rivers, but being interfered with by the sand-hills it was turned and found its way into Lake Benenee, and some into the Warialda Lake. Warialda and Benenee Lakes.

3004. How far do you think the detour of that water went towards the Darling? The Lachlan water must have gone considerably over 100 miles.

Distance from the Darling. 3005. Towards the Darling? Yes.

3006. And how far would that be from the Darling water which you say flowed into Reed's Lake? A distance of from 30 to 40 miles.

3007. You have another station? Yes.

3008. Where is it situated? It is in the extreme north-west portion of the Colony, near the Queensland border.

3009.

Mr. C. Fartiere.

8 Jan., 1885.

3009. Is it near Mount Brown? Yes, the Connopie Downs is the name of the station. It is about 700 square miles.

3010. Is that a dry country? It is.

3011. Are there no creeks there? There are water-courses, but not regular running creeks.

Clay-pans.

3012. *Mr. Donkin.*] Are there no clay-pans there? Yes, there are, but there is a difference between creeks which are running regularly and water-courses which only run occasionally.

3013. *President.*] Where does the water come from? From the rains.

Local rainfall.

3014. Is there no connection with a river? No; we are simply dependent upon the local rainfall.

Bulla River. Salt water.

3015. Does not the Bulla water come down? That is in the clay-pans—not in creeks. The Bulla River ends on one of our blocks in an enormous swamp—one of the largest in the Colony. In connection with that I may mention a thing which much surprised me. I expected from the fact of so much water passing down the Bulla River and disappearing in the swamp that we should have very little difficulty in obtaining plenty of good water by sinking. Within 10 feet of the surface we have struck water, but it is as salt as the sea. It is perfectly useless, and the supply is so great that it seems almost impossible to get through it.

3016. Did you ever try to get through it by putting a pipe down? Not at Connopie, but I have been boring on the Marfield station.

Dry seasons.

3017. I am speaking of this particular swamp? No; I have had dry seasons to contend with the whole time. I have had the station three years, and there has been a drought from the commencement. It has been a struggle to get rations on to the station: I have had to pay as much as £4 a bag for flour as black as this cloth. I have had every disposition to get boring plant on to the ground, but I have been unable to do it.

Mineral salt.

3018. From your knowledge of the quantity of water that comes down the river, there must be a great deal that soaks into the ground? That is what I thought. My impression was that we should have no difficulty in getting a good supply for the stock. The water appears, however, to be so impregnated with some mineral salt that it is useless.

Soakage.

3019. Do you think that that water has soaked into the ground from the swamp? I believe it is the soakage water, and that the water is impregnated with minerals which exist in the ground.

Diversion.

3020. Is there any natural means by which the water that runs down there could be diverted to other parts and conserved? Yes, that could be done.

Cost.

3021. Without any very great cost? Yes, without any very large cost. It would require a few cuttings.

3022. Where could you send it to? The difficulty is that you would have to deal with a neighbouring Colony—we are close to Queensland.

Inlet of canal in Queensland.

3023. Would the water have to be diverted into Queensland? No, but some of the work in making the first cuttings in opening up the canal would require to be made on the Queensland side, to prevent the spread of the Bulla waters over the large flats and swamps before reaching the New South Wales boundary. The operations would have to be commenced further north than the boundary of New South Wales.

Swamp on the Queensland border. Lake Yantaira. Canal to the Bunker and Turkey.

3024. Suppose arrangements were made to divert the water, what part of the country of New South Wales would you bring it through—would you divert it from its present channel? There is a swamp on the Queensland border about 12 miles broad and between 40 and 50 miles long, which fills to a depth of from 12 to 15 feet when the Bulla River is in flood. The waters of the river could be diverted round one edge of the lake by a canal, and brought all through the dry country down to Lake Yantaira, a distance of about 30 miles. It is a mistake to allow the water to spread over a wide area. If a canal is made, the water is kept in a more confined space and there is less evaporation and soakage. The water could be prevented from entering any of those shallow dry lakes, and conveyed through the country by means of a canal into the Bunker and Turkey, which are fine natural water-courses. There are several other creeks, and a surveyor going out might discover a better route for the water. Taking the general lay of the country, I think it would be possible to do what I have suggested.

Flood of Bulla River. Soakage.

3025. You say that when the Bulla River is in flood large quantities of water overflow into the large clay-pans or lakes, from which the water soaks away or evaporates? Yes, it becomes useless, because when it goes into the ground it becomes salty.

Diversion to Bunker Creek.

3026. You suggest that that water could be diverted and taken round the edge of the lake, and conveyed through the dry country to the Bunker Creek? Yes.

3027. And by that conveyed towards the Darling near Wilcannia? Yes.

Filling tanks. Sandy nature of soil and heat.

3028. If that were done, do you not think it would be practicable, by making off-shoots all along that water-course, to fill any tanks that may be made? That is the same question that you asked before. I think that would mean such a consumption of water that you would not be able to obtain an adequate supply. You must take into consideration the sandy nature of the soil and the great heat there in the summer. An enormous quantity of water disappears even in a hard clay soil, by absorption and natural soakage, during the heat of the summer months.

Conservation in narrow channel. Water led by piping. Natural basins.

3029. But does not the water go into the swamps now and escape in that way, and could it not be conserved by being kept in a narrow channel: once the water was stored in that way, do you think the absorption would be so great that there would not be a supply for the tanks? I do not think that there would be no water left, but I do not think you could get a sufficient quantity to supply the tanks. You must consider the position of the tanks, and their distance apart. You would require many miles of communication to reach them. If it could be done by piping or something of that kind such an undertaking might be successful, but if you were to use open channels subject to evaporation and absorption I do not think that the supply of water would be sufficient. The quantity required would be something enormous. The tanks are from 7 to 12 miles apart, and in many cases they are much longer distances apart. I admit that there are plenty of natural basins which might be filled in the way you suggest, and no doubt if they were filled it would tend to increase the rainfall. That is where I think the beneficial part of the scheme would come in.

Tanks near canal —evaporation.

3030. But suppose that tanks from 15 to 25 feet in depth were made near the canal, the evaporation being small, do you not think that when they were once filled they would be almost permanent? Yes; where the tanks were within a short distance of the canal that would be quite practicable. My remarks apply only to the tanks as they are now dispersed over a large area of country, and situated in a very sandy soil; and to reach those tanks it would require cuttings which would chiefly have to be made through light sandy country.

Mr. C. Fartiere.

8 Jan., 1885.

Natural reservoirs.

Raising of water.

Rainfall.

Mr. Russell's estimate.

Rain records.

Average rainfall.

The Darling.

Scour.

Nature of banks.

Cutting from the Darling.

Length.

Wells.

Depth.

Salt water.

Fresh water.

Nature of drift.

Strata.

Boring plant.

Underground salt water river.

Definite lines for shafts.

Prospecting for water.

Old river-beds.

Quality of water.

Direction of old water-courses.

Flow in the well.

Supply.

Artesian water.

3031. Suppose that the tanks were filled with the water which now goes into the swamps, do you not think that the loss by evaporation and soakage would be very much diminished? I am sure of it.

3032. You have sunk wells, have you not? Yes; but before leaving this question I wish to mention that from travelling over the country for a long time I know that there are many natural reservoirs which merely want a little assistance in the way of dams to make them very useful.

3033. It is necessary to raise the water to a sufficient height to fill these natural reservoirs at ordinary times? Yes, at ordinary times. A number of these have been great lakes; they are in good hard soil, and when once you have filled them and are able to keep them at anything like half their level it would add very materially to the rainfall of the district, because the amount of evaporation which takes place must tend to bring about a better rainfall than we have at present. In connection with this matter, I may say that I am quite sure that Mr. Russell's estimate of rainfall is far above what we have been getting—it is far above the average.

3034. But he makes his statements from ascertained facts? But he gets his records from stations which are on creeks or lakes, or something of that kind—places where there always is water, and where consequently the rainfall is much heavier than in other districts not far distant. Water on the surface always seems to have the effect of drawing the clouds, and there is always a bigger rainfall at those particular places where the records are kept than elsewhere, even greater than in localities not far from them. I have known a heavy rainfall in one spot, when 30 miles away there has been no rain. I can show you accounts which will prove that there has been no rain in some districts for the last eighteen months. How, therefore, can we agree with Mr. Russell when he tells us that in those districts the average rainfall has been 10 inches? I have kept a record myself, and I say I have not had an average of 6 inches. Mr. Russell originally estimated it at 15 or 16 inches.

3035. That is a matter we can only decide by getting a large number of private station-holders to send in their reports as you might do. One further question about the Darling: suppose the water were raised by weirs in the manner you speak of, do you think there would be such a scour that the stream might thereby be diverted? No.

3036. You think the banks are of such a nature that the stream would not be able to alter its course? Yes. A private piece of work was done at the junction of the ana-branch with the lower Darling, and it proved satisfactory; a cutting was made from the Darling, and the channel of the ana-branch was lowered, I think, 8 or 10 feet, and that made no difference whatever.

3037. What length was the cutting? I think about 300 or 400 yards.

3038. And that is not scoured at all? No. Originally the water only flowed down when there was a very high flood. A large cutting was made, the squatters defraying the expense amongst them.

3039. Have you sunk any wells at Marfield? I have.

3040. Many? About forty trial shafts.

3041. To what depth do they generally go? From 100 to 300 feet.

3042. What kind of water do you generally get? Salt water.

3043. Have you got any fresh water? I have got one good well and one salt one. I have two wells out of these forty trial shafts—one sufficiently good for stock, but salt; the other a very good one. The rest are all too salt for use.

3044. What is the nature of the drift in which you get the water? It is coarse white sand.

3045. Is it always the same? Yes.

3046. And do you always go through the same class of country down to the water? In some of them there has been a slight change, but there is very little variation. Generally speaking we find clay for a distance of about 60 feet, then after that we get into alternate layers of coarse drift and light sandstone.

3047. Do you find the water in the light sandstone or in the drift? We strike the water in the drift.

3048. Have you tubed any of these wells? I got tired of the trial shaft business, and two years ago I got a boring plant on the ground and have been working away with it. We have not been able to get through the salt water—it seems to be a regular underground river.

3049. Have you in any case found what appears to be an old river-bed? Yes; the old well-sinkers generally say it is an old water-course.

3050. Do you sink these shafts promiscuously, or do you select particular lines of country for them? We pick definite lines of country. We have gone east and west and put shafts down over 2 or 3 miles, where we considered the locality favourable; then we have gone north and south.

3051. What I mean is, do you try to follow any surface indications of underground water-courses? No, we do not. In our country there are no surface indications of water-courses; it is thoroughly dry sandy country, without any indications of water.

3052. Suppose you sink east and west and strike one well here and another there, and you strike what seems to be an old water-course, do you therefrom infer that the whole country in that direction has been a water-course? No, decidedly not. In sinking we always try to find out the nearest points where good water has been obtained, and our endeavour has been to get the same run of underground water when it can be traced; but that means a large expenditure in prospecting for the water.

3053. In how many cases have you struck what has been termed an old river-bed? I do not think in more than three or four.

3054. Not in all? No.

3055. But you get water in all? Yes, we get water in all.

3056. What is the difference between the water generally and the water when you strike the old river-bed? One good well is on what we consider to have been a water-course, but I consider that the next one is not on an old water-course.

3057. Have you any idea what way the water seems to flow in these old water-courses? It seems to me to be making in a south-westerly direction from the north-east.

3058. That would indicate that the direction was from the Lachlan? Yes; I believe that the well I have contains water that has come from the Lachlan in some way or other.

3059. Is there any flow in the well—or did you ever test it to ascertain that? No, I have not tried it for that purpose, but from the extent of the supply I do not think there is any flow. If there were, the supply would be much greater.

3060. What is the supply? About 800 to 1,000 gallons an hour.

3061. In any well have you got artesian water? That is what I have been endeavouring to do, but I have been blocked—I have never been able to get through the layers of sandstone. We generally get through

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through two upper layers but get stopped by a third, and this one we have sunk from 25 to 30 feet in solid hard sandstone before giving up.

3062. The water you have got is not artesian? No; that is why I consider it is an old water-course. It is well washed sand that that water goes through; the other water is flowing through the natural soil, and it is salt. This well of ours is the last, and we have been able to trace that water too. It is a strong well-developed creek, and known as the Sandy Creek on the neighbouring runs, and as Crowl Creek further up nearer the Lachlan. On the adjoining station they have a very good well, and after searching considerably we succeeded in getting this well. Our discovery of this well shows the uncertainty there is as regards the position in which the water is found. The men had been engaged under a bonus to get water, and they had tried several shafts in the same locality, but did not succeed. They were then induced to try again, and they put down three more shafts. The third shaft was put down in a thick bit of scrub, when good water was struck. The scrub was cleared away, and it was found that the good water was within a stone's throw of one of the shafts where they had failed to get good water. Had the men known this they would not have sunk the third shaft at that particular spot, and probably not have found the good water.

Sandy Creek, Crowl Creek.

Trial shafts.

3063. You think that this water has been brought down in an old water-course from somewhere further north—that it has found its way northwards underground? I believe, as far as my experience with sinking for water goes, that the water is making a south-westerly direction by an underground course from the north-east.

Direction of underground watercourse.

3064. Have you sunk on your northern station? Yes.

3065. With what success? Better than at Marfield. We have one very good well there, the water of which is fit for domestic purposes, and we have two very good stock wells. We have sunk about six shafts there altogether.

Wells on northern station.

3066. What depth? The good well is nearly 120 feet deep; the others, from 70 to 260 feet.

Depth.

3067. What supply of water do you get? About 600 gallons per hour.

Supply.

3068. Have you any indications there of old river-beds? It is a different soil altogether. We go through a stiff bed of clay, and then get the water in the drift underneath.

Strata.

3069. Where do you suppose the source of that water is? I imagine that it must be water that comes down from Cooper's Creek. There must also be underground water making its way from the Wilson and Bulla in this part of the country as well as the Cooper; the large bodies of water that are collected by the extensive watersheds in Queensland during the summer rains must have an underground drainage passing through the north-western portion of New South Wales, and locally known as the Albert District.

Source of the water.

3070. You consider that it is water from the nearest river, not finding its way in a channel, but generally underground through the drift? Generally underground drift.

Underground drift.

3071. Have you tried to see whether it is artesian or not. No, but I believe it is artesian. I intend to try and get an artesian supply at Marfield.

Artesian water.

3072. *Mr. Donkin.*] What boring apparatus do you use? The Tiffin borer. I believe that boring will be found the means of watering the back country, but the difficulty is to get the proper kind of labour.

Tiffin borer.

3073. *President.*] You want skilled labour? Yes, if I could have got good men I believe I should have got good water long ago, but the difficulty is to get the men. They seem to be right enough as long as they have every appliance at hand, but when they are out in the bush and thrown on their own resources a difficulty occurs—they cannot get on.

Labour difficulty.

3074. What is the cost per foot of putting down a bore? That is according to the kind of men you are able to get. With us the cost has been about 30s. a foot.

Cost.

3075. *Mr. Franklin.*] What is the nature of the difficulty that occurs in boring? You can get through the top soil, the clay, right enough, but after that you generally strike on the drift, and to get through that you require to use piping. You get the piping through the first drift and probably strike some more clay. You get through that right enough, and then very likely get into a sandstone formation. Well, the auger that goes through the drift and the clay must be of a smaller size when it has to work inside the piping. A difficulty then arises; we have to employ different instruments for enlarging the hole to let the piping through, and there is where the jam takes place. I have got through two layers of sandstone, but on getting on to a third layer I have always been stopped, at a distance varying from 120 to 280 feet. It seems that each successive layer of sandstone is harder than the last, and at last it becomes so hard that instead of the tool cutting the stone, the stone cuts the tool and alters its shape. We cannot get the pipes through, although we use great power. We have put as much as 10 tons on to sink them, we have broken things and even killed horses in our attempts to get down. What I mean by having killed horses is to show the difficulty of keeping such work going at times like the drought we have been passing through. I kept on working carting water required at the boring camp, until at last my horses became so poor they died, and I had to suspend operations for the time; that was over twelve months back, and I have not had water sufficient to start the boring work again since that time. I employed one man who brought credentials from India, where he had been employed in well-sinking; he had been also at the Mont Cénis operations. I gave him a high remuneration, and he did not think he would have any difficulty, yet when he attempted to carry on operations he only smashed things and did more harm than good.

Boring difficulty.

3076. What appliances have you for recovering the rods that jam? The machinery will raise the rods itself on its being reversed. We have tugs and an arrangement like a reversed umbrella; you pass that down and it brings the thing up. I am strongly inclined to think that if we get through the salt water a good supply of fresh water will be found underneath, but the difficulties are very great. I thought I should be able to get through it by manual labour, and I went to Ballarat and engaged some of the best miners there. I kept a gang of men going day and night for three months. We went through 40 feet of water and had to give it up—it was coming in like a water-spout.

Raising of rods

Good water under salt water

3077. And you were in a drift? Yes.

3078. What do you estimate to be the value to a large run like yours of any certain means which could be adopted of going to a depth at which reliable water could be obtained—what amount would you voluntarily spend if it could be done at once: the calculation must of course be based on the amount of money which you have lost in these futile attempts? It would pay a man well to pay £1,000 to get a good and certain supply.

Value of a good and certain supply.

3079. If a canal were constructed near to stations like yours, where water is so valuable as to be worth

£1,000

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£1,000 per well, do you think that the station-holders would take the water? They would take it very readily I am sure.

Duration of supply from tanks.

3080. You have a tank with an area of 12,000 yards full of water—that is 2,000,000 gallons—how long will that last? It is a matter of very great uncertainty whether it will last through the summer. I am very anxious about it, and feel sure the supply would not last me this summer if I allowed the stock to use the water direct from the tank, and I have erected troughing and use a 3-inch Tangye steam pump to water the stock; by this means the water is economized to its fullest extent, but the extra plant and labour necessary make a large additional expense to the station.

3081. How many tanks have you that are a failure? I have eight that are empty, and I have three others with about 3 feet of water in them.

Supply.

3082. With all those tanks full you would have a supply of about 20,000,000 gallons? Yes.

3083. What do you consider to be the value of a full dam? It is hard to estimate it. It means the value of the whole place. If any one offered me the value of the run for my water supply I could not take it.

Daily consumption.

3084. What is the daily consumption on the run when it is lightly stocked? It would be 50,000 gallons a day.

3085. Is the surface water at Marfield fresh in all cases? Yes.

Quality of clay-pan water.

3086. *Mr. Donkin.*] Is the clay-pan water fresh? Yes, until it gets down to a certain level. When the water gets shallow it becomes impregnated with decomposed vegetable matter.

Area and depth of Bulla River waters.

3087. *Mr. Franklin.*] What is the approximate aggregate area and depth of the water discharging from the Bulla River? At the narrowest place two years ago when it was in flood it was about a quarter of a mile wide, and there must have been an average depth of about 4 feet.

Length.

3088. What was the length? Well, that point was between two lakes; I suppose it would be a mile long.

3089. That was a sheet of water? That was a sheet of water. I am sure it was a mile. We took the neck between two basins. The average depth would be about 4 feet.

3090. Does the whole of the water disappear by evaporation and soakage? Yes.

Duration.

3091. How long does it remain? About fifteen months, and then it disappears entirely.

3092. *Mr. Donkin.*] How many years did you say you had been on the Darling? Fifteen years.

3093. Were you there when Mr. Gordon visited the Darling to see if dams and weirs could be constructed? I was in the district, but I did not meet him.

Effect of weir on the Darling.

3094. If a weir was constructed so as to raise the water 10 feet, do you think that would cause the stream to cut its way in another direction? No; it would fill a number of natural basins.

3095. If we put a weir across the stream 6 feet in height, do you think that it would cause a scour? No, the Darling has fine hard banks. It is good clay soil. Each one of those lakes has a natural water-course, and they work through lignum, and it generally takes a wide spread, and the overflow water usually moves along in a wide steady stream at a moderate rate. There are not any great or sudden changes in the general level of the Lower Darling country likely to cause any great scour.

Natural weir at Brewarrina.

3096. There is a natural weir at Brewarrina, and we are told that the stream has forced two channels almost as deep as the original bed of the river? I have not been there.

3097. You think that a weir would not force another channel up above? From my knowledge of the river I do not think it likely. I have been down both sides of the Darling, and I know the outlets.

Outlets.

3098. What causes the outlets? Perhaps some peculiarity of the soil at the spot.

Tallywalkas.

3099. What causes the tallywalkas? They are a natural formation—the natural run of the water in times past. When an excessive volume of water came down the river in times past, the tallywalkas formed outlets by which the surplus waters escaped from the river and found their way back subsequently.

Bulgary swamp.

3100. *Mr. Gipps.*] Is the Bulgary swamp surrounded by high land? Yes, there are some ridges of stone higher than the bed of the lake.

Causes of saltness of water.

3101. Do you not think that the saltiness of the water may be attributed to the evaporation, because all water contains salt? I think there is a mineral deposit in the soil. Large cracks frequently appear in the soil, and these take away large quantities of water which finds its way into the sub-soil; but when once the lake is properly flooded it becomes a good holding ground. We do not always find deposits of

Salt deposits.

salt. One of these lakes is known as a salt lake, and you can gather salt on the surface, but on the other lakes there are no indications of salt; they are fresh on the surface, and we find no indications of any saline matter until the water has become low and vegetable matter has begun to decay in it.

Effects of canal from Bulla River.

3102. Then you think that a canal, by diverting the Bulla River, would serve a twofold object—that it would give a supply of water for distribution, and that it would render the soil more prolific by causing a greater rainfall? Yes, we should get a better vegetation. In some of the swamps the salt is so strong

Lachlan River and Golgol Creek.

that no vegetation can grow. If the Lachlan water were dammed and brought towards the Murray, as I have suggested, it would give a vastly increased value to all that country. I feel sure that in times past the water has run down from the Lachlan into Golgol Creek, and if it could do that again it would mean a permanent water supply for all those stations in the intermediate country.

THURSDAY, 15 *JANUARY*, 1885.

Present:—

Mr. BARTON, M.P.,	Mr. GIPPS, C.E.,
Mr. DONKIN, J.P.,	Mr. LYNE, M.P.,
Mr. FRANKLIN, C.E.,	Mr. McMORDIE, B.E., C.E.

W. J. LYNE, Esq., M.P., President, in the Chair.

Mr. Andrew Kelly called in and examined:—

Mr. A. Kelly. 15 Jan., 1885.

3103. *President.*] What is your employment? I am a drover.

3104. In what part of the Colony? I have been on the Lachlan and all over the Colony.

3105. What other parts of the Colony? All about Wilcannia and the Bogan way; from there to Walgett, and through those parts. I have been backwards and forwards at different times to the boundary of Queensland.

3106.

3106. Have you not been a well-sinker? Yes; I sank wells on the Groongong station, and also on the Tippery station. Mr. A. Kelly.

3107. Whereabouts is that? Tippery station is on the Lachlan; it is Mr. James Tyson's place. 15 Jan., 1885.

3108. What number of wells did you sink at Mr. Tyson's station? Only on that we got watering in. We tried two or three more places. Wells.

3109. What depth was that one? I think about 105 feet. Depth.

3110. That was the one you got the water in? Yes.

3111. What quantity of water did you get—how many sheep and cattle would it supply? It supplied a good quantity of sheep in a drought. Supply.

3112. How many? Say about 6,000 a week for about six months.

3113. You mean 6,000 altogether during six months? Yes.

3114. Was the water good? It was brackish. Quality.

3115. Did it rise to any height in the well? Yes. Rise.

3116. About what height? Well, I suppose that from where the stone gave way—that is, where the stone broke at the bottom and the water came in, it might have been 10 feet.

3117. What kind of stone was it? Hard stone. Stone.

3118. Flinty stone or sandstone? Flinty stone. We never got any good water in sandstone, not even on the diggings, unless we came to a hard rock to split at the bottom. I have searched more for water on the diggings that at any other place. Water in sandstone.

3119. On the Temora diggings? Yes. There is good water procurable there; it is good for stock, though not for human use. Water on Temora diggings.

3120. You say you sank several wells in the Lachlan district, but could get water only in one? Yes. You get all the one water in the Lachlan district, but a greater supply in one place than in another. Water in Lachlan district.

3121. But the water is all of the same quality? Yes, except when you get it near the surface. Quality.

3122. And is it your opinion that all the water in that part of the country comes from the same source? It must be, as all the wells contain the same kind of water. Source.

3123. And all brackish? And all brackish. For your own use the water has to be carted.

3124. At what other places did you say you had sunk wells? I sank for water at Temora.

3125. But you said somewhere else? On Tippery and Groongong.

3126. Where is the Groongong? On the Lachlan, about 60 miles from Hay.

3127. Did you get good water in wells there? Yes, one good one; there was one good one at Tippery. Wells at Groongong.

3128. Have you had any further experience in well-sinking in New South Wales? Yes, in the same district.

3129. Where? About Illillawa. At Illillawa.

3130. That is near Hay somewhere? Yes, near Hay, on the other side of the river.

3131. What sort of water did you find there? We sank three different wells.

3132. Was the water good? No; we were not successful in getting good water. Quality.

3133. To what depth did you sink? We sank to various depths; one well was about 80 feet, another 100 feet, and the third about 130 or 140 feet. The three wells were sunk round about in the same district. That was of course keeping pretty close to the river. In the interior it is different altogether. Depth.

3134. But you have not searched for water in the interior? No, but I have searched for water on the surface and in the creeks.

3135. But simply for surface water? Yes; but I believe sufficient surface water could be got for a small supply. We have done that in other places where we have been pushed for water. Surface water.

3136. In the sand, do you mean? In the sand, where there have been some symptoms of a spring. But as soon as ever the water shows itself, it is rushed with stock and tramped in, so that there is no chance of making use of it. But in some places sufficient water is got to supply an immense number of people. Spring.

3137. Did you sink shafts or wells at Temora? Lots of them. Wells at Temora.

3138. Did you ever get any quantity of water? We only got it in one out of ever so many shafts sunk.

3139. What depth was that? I think it was 160 or 170 feet. Depth.

3140. Was the water good? It was not to say good for drinking—it was brackish. Quality.

3141. Was there a good supply? There was a tremendous supply. Supply.

3142. Did the water rise high? It rose as fast as an engine with a 4-inch pipe could throw it for twenty-four hours without stopping. Rise.

3143. Was it an open well or a pipe? An open well at first, and a pipe was put down afterwards. Pipe.

3144. But the object of putting the pipe down was to pump the water out? Yes.

3145. It was not so much for the purpose of consumption that the water was raised as for the purpose of doing the well? No, it was for consumption. Purpose of water-raising.

3146. You were working in that shaft which you sank, were you not? Yes.

3147. Have you had any experience in any other part of New South Wales? I have traversed the country all over. I have not been much pinched for water except at Hay and Temora.

3148. You have never had any experience on the Darling? Only by travelling over the country. I know where the dams are and so on. There was one place up the Darling where we got water in a sort of blind gully; and when we were in Temora we found two or three little springs, from which after a time we got very good supplies of water. On the Darling.

3149. You have no idea what was the source of the water you got at Temora? Yes, I have; I believe it springs out of the mountain. Source of water at Temora.

3150. How far is the mountain away? It is directly on the road as you go to Hillston, about 100 miles distant from Hillston.

3151. Do you suppose that the spring comes from that mountain? It must come from that.

3152. *Mr. Donkin.*] What is the name of the mountain? It is close to Mick's paddock; you may say it is at Temora. There were springs about the place, not far apart. Springs.

3153. Do you think that any amount of water could be got from the mountain? If it was opened out I believe you could. Water from mountain.

3154. Is it all brackish? No, it is very good water; but at some times it is not so good as at others. When you get a large quantity it is brackish, but when a small quantity comes in contact with the air it is good. The same thing happens on the Lachlan. Quality.

3155. Then you say it is better when it comes out first? Yes, when it comes in contact with the air, but after a little time it becomes of a green colour.

Mr. W. J. Farrer called in and examined :—

Mr. W. J. Farrer. 15 Jan., 1885.

3156. *President.*] Are you a surveyor? Yes.

3157. In which district have you been surveying? The district on the Lower Macquarie, from Warren to Mount Harris, back to the Bogan, Nyngan, and down to near Nymagee.

3158. Is it a defined district—is it named? Yes, but I forget the number.

3159. Have you been surveying any length of time? About seven years. I have been in the district more or less for the last nine years.

Macquarie creeks.

3160. What particular information do you wish to give the Commission? With reference principally to the creeks that break out from the Macquarie.

3161. Will you give us any information that will be of service to the Commission in reference to those creeks? It is about seven years ago as far as I recollect that I wrote to the District Surveyor recommending that reserves should be made where the creeks break from the river, in order that cuttings might be made at some future time. The District Surveyor wrote in reply that what could be done in that way would be done; at any rate I was given to understand that he would see to the matter.

Reserves for cuttings.

3162. Was that when Mr. Dagleish was District Surveyor? Yes.

3163. And do you know whether reserves have been made in any instance at the outlets of these creeks? I hardly know, because the outlets of the Beleringa and Gunningba Creeks, in which I took the greatest interest, were just above my district—in Mr. Burton's district. The creeks run through my district, but the places where they break from the river are outside my district.

Cuttings.

3164. And what was your object at this time in writing to have the reserves made? I thought cuttings might be made from the river at some future time, so that the creeks should get water oftener—so that the water might enter the creeks at a much lower flood than they can at present, the banks of the river being higher than the back country.

3165. So that the fall would enable the water to run into the creeks? I think so.

Banks.

3166. But as a rule where the creeks break off from the river is there not an impediment in the shape of a bank? Yes, there is generally high ground near the junction of the creek and river.

3167. And the water only gets into the creeks when the river is at high flood? Yes, very high flood.

Country benefited.

3168. Can you give us any idea as to the country that would be benefited by the several creeks you mention? A large extent of country. I have my county maps here, but they do not give the whole course of the creeks. I should say the country lying between the Macquarie, the Bogan, and the Darling.

Area.

3169. About what extent is that? I cannot form any idea, except by scaling. Probably it is 150 miles in length, by 50 miles in breadth. My idea is that if money is intended to be laid out, weirs with flood-gates should be placed on the cuttings into the creeks. There are some places where I think shorter cuttings might be made, for instance, just about Warren, into the Gunningba Creek, which is about half a mile from the Macquarie in one place. The breaks in some cases are very hard to distinguish, and would require careful survey.

Weirs.

3170. If weirs were thrown across the river as you suggest, would that store sufficient water to have always some at command to let down these natural channels? I think so, except when the river ceases to run. The river does not cease to run very frequently; it has done so two or three times during the last three years. (*Appendix* S.)

Irrigation.

3171. Do you think sufficient water could be stored in any part of the Macquarie to permit of an extensive irrigation in that part of the country? I think so. The Macquarie, generally speaking, is a running river.

Surveys.

3172. Have you carried out any surveys towards the head of the Macquarie? No; my district only extended from about 4 miles above Warren to 30 miles below.

Natural basins.

3173. In the part of the country you are acquainted with are there any natural basins where water could be stored? Do you mean in the river?

3174. In or near the river? Yes, I know of one.

Large lagoon.

3175. Where flood waters could be stored? I know one large lagoon about 5 miles from Warren.

3176. Is it at a sufficient elevation to command the lower country? I do not think so.

Irrigation.

3177. Then you do not know any spot sufficiently high for the water to command the lower country for the purpose of irrigation? Mounts Foster and Harris are near the river, and if water were raised some country might be irrigated from them by gravitation, but the amount of land would be very limited.

3178. Have you been surveying about the Macquarie marshes? No.

3179. I think I understood you to say you had been down as low as Nymagee? Yes, my district extends to within about 9 miles of it.

Nymagee.

3180. Have you been surveying about Nymagee? Yes; lately I have been within about 9 or 10 miles.

Nature of country.

3181. What is the nature of the country between the Bogan and Nymagee? It is pine and box forest, undulating country, a little sandy perhaps.

3182. What is the elevation—have you any idea? I have no idea.

3183. Is the country at all rangy? In places it is; near Nymagee it becomes rangy, and towards Cobar it becomes rangy, and it is undulating in several parts.

3184. Can you give approximately the height of the country rising from the Bogan in that direction? I am afraid I cannot.

Supply from the Bogan.

3185. Do you think it would be possible, without going to very great expense, to convey water from the Bogan down through that country? I do not think it would; the Bogan itself is too poor a source of supply.

Wheat-growing land about Cobar-Nyngan Road.

3186. I only mention the Bogan in connection with the level of the country—water could be brought into it from other places? I am afraid the country rises too high. The levels taken in the survey of the proposed Cobar-Nyngan railway will throw light on this. If the West Bogan country could be irrigated the gain would be immense, as very much of the land would grow grain, and especially wheat, splendidly. The best looking (for wheat-growing) land that I ever saw lies around the middle Government tank, on the Cobar-Nyngan road. The ascent is very gradual. My idea is derived from Mr. Kinnear, who told me about the frosts they have at the overflow station.

Creeks benefited by cuttings.

3187. For what purpose did you bring your county map? Just to show where the creeks break out from the river, so as to give an idea of what creeks would be benefited by cuttings from the Macquarie. They are the Beleringa, Gunningba, Duck, Crooked, and Mara Creeks; these will all be benefited.

3188. Are these creeks dry now? I think they might be considered as virtually dry. There was one waterhole in the Gunningba Creek containing water, which had been collected by means of drains from some hard ground on the plains; some of the best waterholes however have little or no water in them. Mr. W. J. Farrer. 15 Jan., 1885.

3189. Then, supposing the water were diverted in the manner suggested, you would not expect that a constant stream would be sent down, but only when required to fill up the tanks and dams along the creek? Yes.

3190. But you do not make any suggestion as regards irrigation? No, I cannot make any suggestions; I think the country is too flat, unless expensive pumping machinery were used; and I consider that the extraordinary richness of the land would warrant the expenditure incurred in a trial. I doubt if the ground on the bank of the river is so much higher than the adjacent ground further back as to allow gravitation to be of much assistance. Irrigation.

3191. Is there anything else you would like to say? There is a suggestion of mine with regard to storing water at the crossing of rivers. I have an idea that, instead of making bridges, over-shot dams should be constructed as roadways across such dry rivers as the Bogan. At Nyngan the water is stored by means of a dam. I surveyed the road from Cobar to Nyngan some five years ago, and in my report on that road I recommended that instead of making a bridge over the Bogan an embankment should be made to carry the traffic over. The matter was ridiculed at the time in the Roads Department—in fact "nonsense" was written on the papers when they were sent back to me, but afterwards the railway contractors for the extension, when they were in a difficulty about making a temporary bridge over the Bogan to carry their rolling stock across, made an embankment for the purpose, though they spoiled it by making an artificial cutting for a get-away for the water. Still I think water might be stored in that part of the country by constructing dams at the crossing-places of the rivers and creeks instead of bridges. (*Appendix* S.) Storage of water at crossings of rivers.

3192. Whenever there is a necessity for a bridge you would make an embankment? Yes, some sort of overshot dam. Overshot dam.

3193. You would do that as a matter of saving expense? Yes, and to save water for the use of the traffic.

3194. You think that by making a dam there would be a great saving of public money? Yes. I think those sort of dams would be well suited to that country. My idea was that the overshot dam should be paved with blocks of wood or something of that sort, and made with a depression in the middle. In times of heavy flood the traffic might be stopped for a day or two, but that would be of comparatively little consequence. Saving of money.

3195. Do you know anything of the country between the Macquarie and the Castlereagh? Yes, I have been across there once. Country between Macquarie and Castlereagh.

3196. Is it level country? Yes, as far as I recollect.

3197. Have you been out further than the Castlereagh? I have been on the road to Coonabarabran and Coonamble.

3198. And as far as you have been the country is almost flat? No, when you get near Coonabarabran you get into the Warrumbungle ranges. Warrumbungle ranges.

3199. But taking a straight line from Warren to the junction of the Gwydir and Darling—what is the character of the country there? The part which I know—that between the Macquarie and Castlereagh Rivers—is flat.

3200. And there would be no difficulty in taking a canal through there? I think not.

3201. *Mr. Barton.*] How often are those creeks that you have mentioned as running out from the Macquarie running—do they run every year? It is five years since any of them ran. Water-flow in Macquarie creeks.

3202. And supposing that a weir was put in the Macquarie, how often do you suppose the water would run through? As often as the water was let into them. They would be under your control, and you could let the water in when you liked.

3203. Do you know what height you would have to put a weir in the Macquarie to make the water run down the creeks? Almost the full height of the banks of the river. Height of weir in the Macquarie.

3204. What is the height? I cannot tell you.

3205. *President.*] But that would not be so if there was a necessity for a cutting, and if there is a necessity for a cutting the water would run out before it got to the top of the bank? In that case it would not be necessary to go to the top of the bank.

3206. *Mr. Barton.*] What height do you think the banks are? I should think between 20 and 30 feet. Height of banks.

3207. And how far do you think the water would be thrown back in the Macquarie by a weir? I cannot tell; I should think about 4 or 5 miles.

3208. *Mr. Franklin.*] Do you think there is a fall of 4 feet in the mile in the river—that is a very great fall? I doubt if there is. In that case the water would be thrown further back. Fall of river.

3209. Have you any reason to believe that there is a lateral drainage from the river—does the water fall rapidly? No, not rapidly, but it does fall. The creeks are supplied from the flood-waters of the river.

3210. Then the creeks flow away from the river? Yes.

3211. On either side, or in one direction only? In one direction only. Direction of flow in creeks.

3212. In what direction is that? To the north-west.

3213. Those creeks run a considerable distance, do they not? Yes. They all break from the river.

3214. Do you know whether the fall is great enough to allow a cutting in the bank of the Macquarie to carry the water of ordinary freshes into those creeks? I do not know.

3215. It has never been tested instrumentally, I suppose? No.

3216. And do you think it of so much importance that the levels should be tested by this Commission? I certainly think so. Levels.

3217. You are not aware whether any levels have been taken for the purpose by private enterprise? No, as I said before, it is seven years ago since I wrote to the District Surveyor suggesting that reserves should be made to enable the Government to make cuttings at any future time.

3218. *Mr. Donkin.*] You suggested that where the off-takes occur the channels should be deepened and a weir put across the river? Yes. Weirs and channels.

3219. Is it your opinion that if a weir were put there it would cause the river to make a new channel? No; the weirs would have flood-gates, which would only be closed when you wanted to let the water into the cutting. New channels. Flood-gates.

3220. But if any obstruction at all is put into the river, do not you think it would cause it to cut a new channel? No, I do not think so.

Mr. W. J. Farrer. 15 Jan., 1885.

3221. Do you know any dams across the Macquarie? No.

3222. Do you know any dams of the Bogan? Yes.

3223. Is the river cutting a new channel there? Yes, it is.

uddall dam. 3224. Not in the case of the Muddall dam? Yes; there are embankments put across the cuttings in all directions.

By-wash. 3225. But perhaps a by-wash has been cut? I cannot say whether there has or not, but I think not.

3226. But you think that a weir with a flood-gate in it would prevent that? Yes; there should be two flood-gates, one in the weir and the other in the off-take.

Muddall embankment. 3227. How many miles back does the Muddall embankment throw the water? I do not know.

Dams instead of ridges. 3228. You say that you suggested to the Government that instead of building expensive bridges they should construct dams? Yes.

3229. Do you think that would be necessary? Yes, but the best mode of making the dams would have to be found out.

3230. Is not the fact that the Muddall dam has stood fifteen years some guide? There has been no traffic across that.

Effect of traffic. 3231. *President.*] Traffic would rather strengthen it? Yes, but those lines of traffic do not cross where there are good natural get-aways. Of course, when a station dam is made, the site is chosen for the get-away.

Height of Nymagee. 3232. *Mr. Donkin.*] You do not know the height between the Bogan and the Nymagee: Nymagee is on the fall of the Lachlan is it not—you cross the Dividing Range just before you get to Nymagee? Yes, I think it is on the fall of the Lachlan.

Height of Dividing Range. 3233. Do you not know what the fall of the country is up there—would you say that the Dividing Range was 1,000 feet above the sea? I should think it was.

3234. That would make it 400 or 500 feet above the Bogan at Nyngan? Yes, the Dividing Range, of course, varies in height.

Nature of country. 3235. It is undulating granite country, with rough hills and bases, is it not? Yes.

3236. Have you been to Eremeran? No, but I have seen the Dividing Range as it goes through the Melrose and Walker's Hill Runs, but I was never on the Eremeran Run.

3237. Have you been west of Cobar? No; I have been as far as Cobar, but never west of it.

Crowal Creek. 3238. Is the country at Cobar as high as at the head of the Crowal or Crowie Creek? Those Crowal or Crowie Creeks are rather mixed. The last thing I did was to survey a creek called the Crowal Creek, and it is quite distinct from what is called the Crowal Creek a short distance away.

Diversion towards Nymagee. 3239. Do you think that water could be taken from Nyngan across the range to Nymagee through that country? I do not think so.

Construction of dam. 3240. *Mr. M'Mordie.*] Will you explain a little more clearly how you propose to make an over-shot dam to serve the purpose of a bridge? Well, my idea was that the over-shot dam should be paved, or something of that sort.

3241. But you would have the same quantity of water flowing over the dam that would otherwise flow in the bed of the river? Well, the rivers across which I propose to put the over-shot dams flow very seldom.

3242. And therefore a bridge would not be required for purposes of traffic? Well, the rivers are flooded at times.

3243. But would not the over-shot dam be flooded at the same time, and therefore would it not fail to serve the purpose of a bridge? It would serve the purpose of a bridge, although the traffic might be stopped for a few days.

Bogginess of rivers. 3244. But at the time the bridge is required the over-shot dam would not serve the purpose of a bridge? But there is this to be considered,—that the beds of the rivers become so boggy, and it is the bogginess that is the great drawback.

3245. Then the purpose of a bridge could be served by paving the bed of the river? But then you would lose the advantage that I propose from the over-shot dam, viz., the storage of water for the use of the traffic.

3246. *Mr. Donkin.*] When there is a big flood in a river, even if there is a bridge, you cannot get to it? If the river ran at all the over-shot dam would be filled, and perhaps a small stream would trickle over it for a short time.

3247. *Mr. M'Mordie.*] There would be the same disadvantage with an over-shot dam as with the water running over the bottom? Yes, at times of high flood.

Depression in centre of dams. 3248. *President.*] But in the cases you speak of, supposing that a dam were placed across a river and an indentation paved in the centre, the dam would throw the water a considerable distance over the country around before any went over the dam? Yes, but that would depend on the height of the depression in the centre.

Places for dams serving as bridges. 3249. Do you know of any case where the building of a dam to serve the two purposes of a dam and a bridge would be serviceable—in the Macquarie, or the Bogan, or any of the creeks? It would have done at Nyngan; it would do where the travelling stock route crosses the Bogan at Buddabadah.

3250. Is not the traffic over the creeks and almost dry rivers frequently stopped for months on account of the beds being boggy? It is not stopped altogether, but heavy teams have great trouble in getting across.

3251. And is the object of building a bridge to get across at flood-times or at ordinary times? Both.

3252. But more particularly which? At ordinary times.

Bridge at Dandaloo. 3253. *President.*] I may mention that at the present moment there is an application for the building of a bridge at Dandaloo, on the Bogan, and the only water there is water backed up by a dam 5 miles further down the river. The bridge is applied for because the bed of the creek is so boggy that the teams cannot cross. I mention this in support of what Mr. Farrer suggests. It is not for the flood-water that bridges are required, but the bed of the Bogan is so boggy that teams cannot get across at all.

3254. *Mr. M'Mordie.*] In that case the proper course is to form a solid roadway through the bed of the river.

Watersheds. 3255. *Mr. Gipps.*] Are there any defined watersheds to these creeks? No, I do not think there are; there is a watershed on the west side of the Bogan, but not on the east side.

Outcrop of rocks. 3256. Is there any outcrop of rocks in the beds of the creeks? None that I am aware of.

Mr. W. J. Farrer. 15 Jan., 1885. Steam scoop.

3257. *President.*] Is there anything further you would like to explain to the Commission? Not long ago I went to see a steam plough and scoop at work near Nymagee, making a tank on the Nymagee and Nyngan Road. One thing in connection with that plough and scoop which had been overlooked was pointed out to me. The scoop when full of earth represents a weight of 10 tons, and when dragged over the ground makes it almost like rock and very hard to pick. The sides of the tank however were not the exact batters required by the Government, and so the contractor had to pick away the hard ground to make the batters according to the specification. Then in consequence of the hard earth being picked away the water would soak through the ground to a depth of 5 or 6 feet, and so the tank would be spoiled to a certain extent. One of the great advantages of the steam plough and scoop is that it hardens and compacts the batters, and prevents the water from soaking away.

3258. *Mr. Donkin.*] Is the tank full now? No; the contractor had not finished it.

Best ground for water reserves.

3259. He was not making a circular tank? No. There is one thing with regard to work in my district. I have had a great deal to do with applications for water reserves, and my idea is that the best water reserves that can be made are the areas of hard red ground.

3260. *President.*] It is good holding and catching ground? Yes. I have had to report on numbers of applications for water reserves on areas that are totally unfit for holding water; people have applied for water reserves in cowls where the water would soak away at once—they would never retain water.

Cowls.

3261. *Mr. Donkin.*] There is a large cowl at Canonbar, is there not? There are cowls about Canonbar—I do not know of one at Canonbar.

THURSDAY, 22 JANUARY, 1885.

Present:—

Mr. DONKIN, J.P., | Mr. GIPPS, C.E.,
Mr. FRANKLIN, C.E., | Mr. M'MORDIE, B.E., C.E.

F. A. FRANKLIN, Esq., C.E., IN THE CHAIR.

Mr. M. A. Maclean called in and examined:—

Mr. M. A. Maclean. 22 Jan., 1885. Lake Cargellico.

3262. *Chairman.*] You are in the Government Service? I am a draftsman in the Survey Department.

3263. Are you a resident in the back country of New South Wales? No, I am a resident in Sydney.

3264. What kind of information do you desire to give to the Commission? It is with reference to what I may call an artifical lake—Lake Cargellico, near the Lachlan River.

3265. On what part of the Lachlan? Near Euabalong.

3266. How far below Condobolin? About 60 miles. I spoke to Mr. Gipps about it, to show how easily water might be conserved at that particular place. The lake is really a submerged plain, and fills during flood in the Lachlan. By a small lock the water is prevented from receding or running back into the Lachlan.

Dam.

3267. There is at present a small lock there? Yes, or small dam.

3268. Is there a dam across the Lachlan, in the vicinity of the lake? No, not across the Lachlan. The dam is across a creek which connects the lake with the river.

3269. How far from the entrance into the lake—how far down the river is the nearest dam? The dam is across a creek which connects the lake with the river; I do not know how far it is from the nearest dam.

3270. *Mr. Donkin.*] Have you seen a dam about there? No, I have never seen any dam in the vicinity.

Supply.

3271. *Chairman.*] At about what level of the Lachlan is this lake supplied in freshets of the river? In ordinary floods.

3272. When the water is within the banks? Yes.

River level.

3273. And what rise of water would that be above what is called the summer level of the river? I believe a little over 12 feet rise would throw water into the lake.

3274. After a flood in the river has subsided, does the water run back from the lake, leaving it shallow again? Yes, most of the water would run back if it were not for the lock.

Silting.

3275. Do you know whether there is a large amount of silting near the position of this lock? Speaking from memory, I think not. The water from the lake goes through marshy country before it gets to the lock. The lake is about 2 miles from the Lachlan River.

Regulation of lock.

3276. Need the lock be regulated to let the water back into the river? Yes, it is done periodically, in order to get fresh water during any flood.

Notice of flood.

3277. I suppose there is timely notice of any flood? Yes.

3278. At whose expense was the lock and the entrance to the lake made? At the expense of the lessee of the run.

Permanency of supply and area.

3279. Could you give any information as to the permanency of the water and its area? The area of the lake is about 10 square miles, with an average depth of about 11 feet. Strictly speaking it is a chain of lakes—Cargellico, Manie's, and Maria's, Cargellico being the largest and deepest.

Natural channels.] Levels.

3280. Are these lakes connected by natural channels? Yes.

3281. How are they with regard to levels—do they draw from one to another? Yes, from the back lake (Maria's), towards the river.

Distance between lakes.

3282. And what is the distance of the several lakes from each other? They run almost into each other—there is no definite channel between them.

3283. I suppose you are acquainted with the prevailing levels of that locality? No.

Position of lake.

3284. Can you say whether the water could be distributed by gravitation from the lake? I think not. The lake is in the bed of a low-lying plain.

Raising of level of lake.

3285. Do you think it possible that the level of the lake could be raised by artificial works above the level of the surrounding country? Yes, I think it could.*

3286. But only when the entire country was flooded—now it is filled only when the river is full? Yes; the lake could be raised to a higher level by embankments constructed around it.† 3287.

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* NOTE (*on revision*):—I misapprehended this question. The answer is *No.*—M.M.

† NOTE (*on revision*):—I took this question, with the preceding one, to refer to keeping the lake at a higher level than usual, which can be done by raising on the dam across the creek.—M.M

Mr. M. A. Maclean.

22 Jan., 1885.

3287. But suppose these improvements were made, I do not see that any one but the lessee would benefit by it? There is a mining township on its banks, and a considerable number of selectors around.

3288. Can you give the Commission any further information with regard to the lake, to show that the water could be made available to others besides the lessee, or how the storing capacity could be increased? I believe the Department of Works intends to take charge of the lake, and regulate the supply of water by flood-gates and a proper dam. The present dam is a very primitive one, which cost about £200, although it ensures the lessee a valuable supply of water.

Regulation of lake by flood-gates.

Depressions on the Darling.

3289. Do you know any other depressions near the Lachlan which could be treated in that way if inlet cuttings were made? I do not think there are any others on the Lachlan. There are many depressions on the Darling, about Menindie.

Natural inlets.

3290. They have no natural inlets? No; there is in the river sufficient water for stock, and the land-holders prefer to use the beds of these lakes for pasturage.

Effect of droughts.

3291. I suppose the portion of the Lachlan about Lake Cargellico has suffered as much from drought as other parts of Riverina? Yes, very much. I believe that the lake is very low now, although there is water in it.

Evaporation.

3292. Is that owing to the consumption for stock? Not only that, but also to evaporation.

Soakage.

3293. And soakage, perhaps? And soakage.

3294. Do you know what means the lessees in the vicinity of this lake use for getting water for stock? Mostly tanks, back from the river.

Tanks.

3295. How are they formed? By excavating in depressions.

3296. The country is level? It is undulating in the vicinity of the lake.

Nature of soil.

3297. Is it good holding ground where the tanks are made? Yes; a red clayey soil.

3298. I suppose you do not know anything about the water derived from the wells about there? No.

Dam-making.

3299. Did you notice the style of dam-making, and what mode is adopted of protecting the water from winds? No.

3300. Did you notice the tanks particularly? I did not inspect them generally; those I inspected were merely excavations.

Disposal of soil.

3301. How was the excavated soil disposed of? By embanking, so as to make a dam as well as a tank.

Depressions near Menindie.

3302. Can you give us any information as to depressions on the Darling, similar to those you have been speaking of? There are similar depressions near the Darling, but much larger. Close to the town of Menindie there are several of them.

Value of pasturage in lakes.

3303. But you say the people there do not encourage the flow of water into them? They do not take steps to retain the water in them, as they consider the pasturage the depressions afford is more valuable.

3304. To keep them full of water would then do them permanent damage? It might at present. At this time the grass is more valuable than the water. We are taking steps to reserve all these areas.

Weir across Lachlan.

3305. If a weir were put across the Lachlan, below Cargellico Lake, would it throw the water far up in the Lachlan? I cannot say.

3306. You do not know the slope of the water? No.

Effect of weir.

3307. If a weir were raised 4 feet, you do not know how far the water would run back? I have no idea.

3308. Have you any reason to believe, from what you know of the flow of the Lachlan, that the flank of an ordinary earthwork dam would be turned if one were put in there; or would the river be diverted by the obstruction? I was only on one side of the river at a particular spot, and I cannot say.

Lakes near Menindie.

3309. Have you any further information you wish to give to the Commission? There is a small lake close to Menindie, with an area of about 26 miles; indeed, there are two lakes close together, named Pamamaroo and Tandore Lakes.

3310. How far is the lake you speak of from Wilcannia? It is close to Menindie—about 10 miles away I think.

3311. Up the river? Yes.

3312. It has been surveyed to scale as shown by you? Yes, in part.

Area.

3313. What is the area? About 26 square miles.

3314. Have you any memorandum of the average depth? No.

3315. It is close to a bank of the river? Yes.

Inlet.

3316. Is there an inlet at that place? There is an inlet, with apparently sound ground, which the travelling stock route crosses.

3317. What is the length of the inlet? About 2 chains or a little more.

Effect of drought.

3318. Do you know whether the water has remained in the lake during the late dry seasons? I believe it has not.

3319. It is perfectly dry now? Yes.

3320. You do not know the mean depth of it? No.

Dam.

3321. Are you aware whether any dam has been made to keep the water constantly in this depression? I believe not in the case of the one near the Darling.

3322. From your observation you do not know that it is practicable? No.

3323. Can you put in as an exhibit the tracing you produce? No, but I can send you copies of it. (*Appendix* T 1.)

3324. Have you any further information you wish to give? I think not.

Bank of Lachlan.

3325. *Mr. Donkin.*] Did you notice the depth of the bank of the Lachlan at Lake Cargellico? It is over 30 feet.

Slope of country.

3326. *Chairman.*] Do you know if we can ascertain whether there is a point at a low level, so that the water could be diverted from the lake to the adjacent country? No, I think the country slopes towards the lake.

3327. If you are in doubt, could we get the information from the Survey Department, or from the officer in charge of the district? Mr. G. W. Walker, who made surveys round the lake, might give some information.

3328. *Mr. Donkin.*] In what year were you at Lake Cargellico? In 1880.

3329. Have you ever been at Lake Cowal? No.

Other lakes.

3330. You have not seen any of these other lakes on the Darling? No.

3331. They are shallow as compared with Lake Cargellico? Yes.

Catchment.

3332. Next to Lake George that has the best catchment—better than any in the western district? Yes, though it is quite an artificial lake.

Length of dam.

3333. *Mr. Gipps.*] What is the height of the dam across the creek connecting the Lachlan with the lake? Nearly 14 feet.

3334. What is the height of the highest flood at this position of the dam? About 5 feet above the dam. Mr. M. A. Maclean.
3335. What is the dam constructed of? Of clay, stakes, and boulders.
3336. What is the length of it across the creek? About 150 feet, I think. 22 Jan., 1885.
3337. What is the character of the country—is it rocky, and what is the surface soil in the vicinity of the lake? I cannot remember; I do not think it is sandstone. Character of country.
3338. Is the soil impermeable? Yes; red clay.
3339. When the water in the lake is low, is it sweet or brackish? That I could not say; I have tasted the water, but that was when the lake was full. Quality of water.
3340. *Chairman.*] What is the name of the lessee? Mr. Mackellar. The elder Mackellar died last year. The son would be able to give you information. Lessee.
3341. What is the name of the run? Wooyeo. Name of run.
3342. *Mr. Gipps.*] You say the lake is in a basin: is there a range of hills on all sides of it—would the longitudinal section be long, or how long would be the longitudinal section through the hills—is it a regular range of hills? Yes, on two sides. I do not know what the longitudinal section would be; it would be some miles. Range of hills.
3343. Would a tunnel enable the water to flow on to the surface after crossing the range? I think not—the lake is so depressed. Tunnel.
3344. *Chairman.*] You are not aware of the existence of any levels of the land on the other side of the range showing the line of the fall of water? No, I am not aware of any. Levels of land.
3345. You are still in the Survey Department, are you not? Yes.
3346. Can we get copies of these plans you have put in to-day? Of course, with pleasure. Plans.
3347. Can you tell us what you will send in as appendices to your evidence? Locality map of Menindie, showing lakes, tracings of sections and cross sections and sketch of creek from Lake Cargellico to Lachlan River; I will also show the areas of these lakes as far as we can ascertain them. (*Appendices* T 2 *and* T 3.) Appendices.

Mr. M. Campbell Laingtree called in and examined:—

3348. *Chairman.*] You are a resident in the district of Cobar, or near there? Yes. Mr. M. C. Laingtree.
3349. You are engaged in pastoral occupations there? Yes, near Cobar.
3350. I suppose you are well acquainted with the district and its resources? I know it very well, having travelled over it. 22 Jan., 1885.
3351. What is its present condition? Its condition just now is very bad—the country is exceedingly dry. Country near Cobar.
3352. What provision is made there for the water supply of stock? We make tanks; on some runs between Cobar and Bourke they have wells also. Tanks.
3353. Do you find that the tanks on the present system of construction provide you with permanent water? Yes. If you make tanks 15 feet deep with dams on the lower side, it lasts longer than the grass does, we find. Supply.
3354. With regard to the losses of stock, do you estimate that you lose more for want of pasturage than you lose for want of water in that district? Altogether I think we lose more for want of pasturage. Previously, stockowners depended on the gilgais, and lost a good deal of stock for want of water. Causes of loss of stock.
3355. With your present arrangements how long could your stock exist without the ordinary rains—for a year or two? I do not think our water supply would have failed if sufficient rain fell to make the grass grow. There would be occasional thunder-storms, and we make long drains, which is the secret of keeping the tanks filled with water; almost every drop of rain that falls by this means goes into the tank. Duration of supply.
3356. They are open V-shaped drains? They are open flat drains made with plough and scoop, about 6 inches deep, and from 3 to 8 feet wide, with the stuff placed on the lower side forming an embankment. They are contour drains with the least fall, cut to get the greatest length. Shape of drains.
3357. Before making the drains do you make an instrumental examination of the ground? Yes, we always lay the drains off with the level; we make a regular fall of about 1 inch to the chain, sometimes 2 inches if there is gravelly ground. Laying of drain.
3358. If you had a permanent head of water, would it pay the pastoral tenants to make these drains a considerable distance through their runs? I think they would pay.
3359. I think you said you did not take levels in laying out the drains? Oh yes we do.
3360. For the supply of the tanks? Yes; but we only do so in order to get the longest drain we possibly can get. By laying a drain 1 inch to the chain, we calculate that is about the smallest fall we could give it to prevent the water being absorbed in its course; when there is loose ground you cannot get a smaller fall. Fall of drains.
3361. What is the extent of your run? 60,000 acres—one block. Extent of run.
3362. What do you estimate your permanent water supply to be? About 45,000 cubic yards. That is the actual excavation; but there are dams round the tanks which conserve a supply equal to three times that amount. Water supply.
3363. Has the water ever risen above the level of the excavation? Yes. Rise of water.
3364. To what height? 5 and 6 feet.
3365. Do you find the embankments retentive? We always make them so by constructing them in layers, and consolidating the material by travelling drays over it.
3366. Has there been any great evaporation of the water above the surface? I cannot say; but where there is a new tank I suppose the principal loss is by absorption. Evaporation.
3367. You have never kept records of the loss by evaporation? No, though the loss by that means would no doubt be greater when the water spreads over a large surface.
3368. That is, the larger the surface exposed the greater would be the loss? Yes.
3369. Have you any wells on your run? I put down one 110 feet but got no water; it was in a shallow watercourse where I sank the shaft. Well.
3370. What distance was that from the tanks? From the nearest tank it would be about 2 or 3 miles.
3371. You have no reason to believe that the water you have been turning into the tanks forms an underground supply? No; the bottoms of the tanks are impervious to water. Impervious bottom of tanks.
3372. What is the nearest well to you where you were successful in discovering water? I believe there is permanent water 10 or 12 miles from the shaft I sank, but I do not know that as a matter of fact. Permanent supply in well.

Mr. M. C. Laingtree. 22 Jan., 1885.

3373. What are the general features of the country about Cobar—is the country ridgy or level? It is undulating about Cobar.

3374. Does the country seem to fall from Cobar in every direction? Yes, especially towards the Bogan and Darling.

3375. You do not know the height of Cobar above the Darling? No.

Fall of country near Cobar.

3376. In each way from Cobar does the country fall so as to afford drainage—does it fall in the direction of the Darling, or parallel with it? I think generally in the direction of the Darling. The country between Cobar and Nyngan is comparatively flat—for 30 miles from Nyngan towards Cobar the country is almost absolutely flat.

Nature of country.

3377 What is the nature of the country from Cobar in a direct line to the Bogan? Undulating about Cobar, and flat for about 30 miles from the Bogan.

Direction of drainage.

3378. What is the direction of the water drainage from Cobar? Towards the Darling.

Diversion from Bogan towards Cobar.

3379. Do you think the water of the Bogan could be conveyed any distance towards Cobar in time of flood? I should think it could be conveyed in that direction for 15 or 20 miles.

Dry channels.

3380. Do you know of any dry channels existing there? I do not know any ana-branches, if that is what you mean.

3381. Or dry creeks? I do not know of any on the Cobar route, or between Nyngan and Cobar.

Shape of tanks.

3382. Which do you consider the best shape for tanks in your part of the country? For watering stock we always make them square on the top, with side slopes of 3 to 1 all round; but to conserve water and have as little evaporation and absorption as possible we make the slopes 1½ to 1; the greatest depth we

Depth.

give is 20 feet. I have not got a tank 20 feet deep, but the adjoining runs have them that depth. We usually go down until we reach the rock. The average depth of tanks in the Cobar District is about 13 feet.

Watering stock.

3383. In what manner do you water the stock? We allow them to water themselves.

Slope of tanks.

3384. What slope is there at the approach to the tank? 3 to 1, or 6 to 1 on roadway of tank.

Roadways.

3385. You do not provide an apron to protect the slope? No; we sometimes make the tanks with two roadways at each end, the slope of the roadways being about 6 to 1.

Stock.

3386. What kind of stock is it in that part of the country? Sheep.

Aprons.

3387. Do you not find it objectionable to allow the sheep to go into the water? Yes, it would be better to keep them out; but everything is quite new in that district. I have no doubt that in course of time aprons will be laid in the shape of wooden gratings, so that the sheep can water on them.

Waste of water by fleeces.

3388. Do you not think that the fleece would carry away as much water as the sheep can drink? Yes, if the sheep went deeply into the water, and they often do; but as they generally drink without wasting a great deal of water we have not yet taken steps to save loss in that way.

Troughing.

3389. As a general rule it would be better for full fleeced sheep not to go into the tanks? It would be better that sheep should not go into the water, and it would pay to have troughing at each of the tanks; up to the present, however, there has been nothing but outlay with very little return since the Cobar

Want of grass.

country was occupied.—the losses have been great for want of grass.

Pumping from tank

3390. If there was a probability of losing water from drought, would it not be better to adopt the system of the Government in pumping from the tank? I think so.

3391. *Mr. Donkin.*] Have you had any experience in water conservation in any other country? Only in Victoria, where I was occupied with water supply for some time.

Water conservation in the west.

3392. Can you suggest any general plan for water conservation in the western district? If the Government determine to lay out any sum of money in a water supply, overshot dams might be put on the flat or flood creeks to throw the water back so that it might be conveyed from the flooded parts of the country.

Creeks and depressions. Overshot dams.

3393. There are several of these creeks in this district? Yes, and all run towards the Darling. I do not know of any ana-branches of the Bogan, but I should think plenty of depressions could be found if overshot dams were made.

System of dams and wells.

3394. Do you think that money would be better expended in conserving water on these flood channels and throwing it back than in sinking wells? I think the system of dams would certainly be the best, because the dam fills naturally, whereas the water from wells has to be brought to the surface, except in the case of artesian wells.

3395. You know of no artesian wells in that district? No.

3396. What distance could water be thrown back with a dam 6 feet high? 3 or 4 miles.

3397. And you recommend a system of over-shot dams? I do.

Loss of stock.

3398. Then from your experience in the Cobar district you have not found stock to die for want of water? I have known it to be the case, but only when the tanks were new and not filled before the dry weather set in.

3399 Do you think that the present means adopted of conserving water is sufficient to keep stock alive, and that the deaths occur not from want of water but from want of grass? I think we want more water—many of the tanks have not been filled—but generally speaking the stock die for want of grass, because

Water supply from Darling.

the water in the tanks outlasts the grass. I think the Darling is the place where the greatest water supply could be obtained; there are ana-branches there, and by means of over-shot dams these ana-branches could be kept continually full without interfering at all with the water in the river, because they would be filled at flood-times, and the river would flow over them. The ana-branches would be filled without lessening the water in the river.

Springs.

3400. Do you know of any natural springs in that country? No. When I first went there I found under the hills what I thought to be springs, but I subsequently discovered that they were simply soakages, stopping when the rains stopped.

Gilgais.

3401. Is there any natural water between the Bogan and the Darling? Only small gilgais. There is no permanent water in the Cobar district that I know of, unless artificially made.

Expenditure on water conservation.

3402. *Chairman.*] Can you give anything like an average of the expenditure for water conservation on the runs there? I should think if 15d. to 17d. per yard were allowed for all the excavation that would give some idea, but I do not know what the gross amount would be.

3403. But could you not give approximately the number of cubic yards excavated for the conservation of water for each 10-mile block, say? I should say about 40,000 yards for each 10-mile block. If properly distributed that would be about £3,000.

3404. The water is worth the interest on that money, at 6 per cent, I suppose? More than that—money cannot be better laid out than in providing water for the back country.

3405. You think that some system of keeping a permanent supply of water by payments at that ratio would be supported? Certainly. Mr. M. C. Laingtree.

3406. *Mr. Donkin.*] From your general knowledge of this part of the Colony do you think a system of irrigation could be adopted? Not in the Cobar district. Conserving water would pay, but not irrigation. 22 Jan., 1885. Irrigation.

3407. Could it be carried out? I think not; I am almost sure that a system of irrigation could not be carried out except at an extravagant outlay which would not admit of its being a commercial success.

3408. *Chairman.*] Do you think it absolutely necessary to finish off your tank with angles neatly cut? No; we simply lay them off square for convenience in measurement. The men in that district understand making them square; any other shape would cost more. Angles of tanks

3409. Do you think a square tank is preferable for stock? No.

3410. *Mr. Donkin.*] In Riverina they make merely a basin with plough and scoop? Yes; but I do not know how by this means they dig out a circular tank. I should think it would be a more expensive process than in making a rectangular tank. Still, I think a circular tank is preferable to a square tank, as the stock can get round it. Circular tanks.

THURSDAY, 12 *FEBRUARY*, 1885.

Present:—

Mr. DONKIN, J.P., Mr. GIPPS, C.E.,
Mr. FRANKLIN, C.E., Mr. MURRAY, M.P.,
Mr. M'MORDIE, B.E.

F. A. FRANKLIN, Esq., C.E., in the Chair.

Mr. Harry A. Gilliat, Inspector of Public Tanks and Wells, called in and examined:—

3411. *Chairman.*] What is your official position? Inspector of Public Tanks and Wells. It is probable that under the new Watering-places Act of 1884, I shall be appointed with a fresh designation—it may be as Inspector of Public Watering-places. Mr. H. A. Gilliat. 12 Feb., 1885.

3412. Is that business to be under the supervision of the Mines Department? Yes.

3413. The information you have to give is from tabulated statements you have prepared? Yes; they were prepared from my own inspection, and were to accompany my annual report, which will to a certain extent review the work of five and a half years.

3414. Will you afford us some information as to the order in which you prepared your papers, with regard to tanks particularly? I have here (*Appendix* U 1) a list of the public watering-places at present in charge of the Mines Department, which consist of thirty-five tanks, seven wells, four dams, ten springs. There are twenty-five additional springs at the Peri tank, but except one, they are as yet undeveloped. There is also one large waterhole at Momba, on the line of road between Wilcannia and Hungerford, going up the Paroo. Tanks.

3415. Will you give us some information in the order of your summary, taking each item in its turn? I find by a rough memorandum here, which I made in anticipation of questions by the Commission, that of the tanks in charge of the Mines Department, we have twelve with a conserving capacity of 3,000,000 gallons each; sixteen with a capacity of 2,000,000 gallons each; one with a capacity of 4,000,000 gallons; one with a capacity of 12,000,000 gallons; giving a total of 73,500,000 gallons for thirty tanks, and an average of 2,450,000 for each tank. We are notified by the Department of Public Works of twenty-one new tanks now ready for transfer, and they will probably be transferred within the next few weeks. Of these, seventeen will have a conserving capacity of 3,000,000 gallons each, equalling 51,000,000 gallons; two will have a capacity of 5,000,000 each, equalling 10,000,000 gallons; two will have a capacity of 4,000,000 each, equalling 8,000,000 gallons; giving a total of 69,000,000 gallons, and an average per tank of 3,250,000 gallons. Capacity of tanks.

3416. Have these tanks been made under the superintendence of the Roads Branch of the Public Works Department? The Roads Branch construct the tanks.

3417. The return you have prepared is in reference to those tanks of which you are in possession or about to take possession? Yes; the last list has been handed to me by the Public Works Department as a list of the works they have completed, and which are now ready to be transferred to the Mines Department. Tanks in charge of the Mines Department.

3418. The proportion is about twenty-one tanks to thirty? There are thirty tanks in charge of the Mines Department, and there will be twenty-one more in the course of a few weeks.

3419. Do you know how long these twenty-one tanks have been in progress? No, but I do know that to a considerable extent the works have been delayed owing to the severity of the last three seasons.

3420. Can we get any record of the additional number of tanks constructed per year? Comparatively; my reports since 1869 will show the transfers to the Mines Department. Under the heading of the Stock Branch, I have given reports in 1881, 1882, and 1883, in the Annual Report to the Minister, of the tanks and wells. Tanks constructed per year.

3421. Could you give us a memorandum to be attached to the evidence, showing the tanks between the Darling and the Murrumbidgee in progress, and the increase each year in number? I first inspected tanks and wells in 1879. In 1880 I made my preliminary report, early in the year. I think we had then thirty watering-places completed and in progress; and since then in each successive year we have had a small increase in the number of works. But large numbers have been recommended for construction each year. The largest sum of money on the Estimates in any one year, prior to my appointment, for the construction of dams and wells, was £10,000. My recommendation was for thirty new works immediately, and we have been going on with twenty-five or thirty works per annum. But in the last three years it was almost impossible, in consequence of the drought, to get contractors to take up these works.

3422. Does any portion of the vote lapse if you do not make the expenditure? That rests with the Public Works Department. The whole of the construction is in the hands of Mr. Bennett, Commissioner and Engineer for Roads and Bridges.

3423. The vote has never been increased much from year to year? Large increases have been made since 1879. In 1880 or 1881 it was proposed to vest the subject in one Department, and a vote was obtained by the Mines for £50,000 sterling, but objection was made by the Department of Public Works to the surrender Vote of money.

Mr. H. A. Gilliat. 12 Feb., 1885.

surrender of the construction. It was subsequently arranged the Mines should take the control and maintenance of completed works, and that the construction and all repairs would remain with the Department of Public Works.

Advantage from Water Trust Department.

3424. Do you think that if a proper Water Trust Department were appointed you could expend a larger sum with greater advantage on this class of works? I think the whole question of water supply should be under one special branch to undertake the construction and maintenance.

Delay of works.

3425. You think that many projected works have not been carried out for want of a larger Department? I think they have possibly been delayed because we have not always had the necessary amount of money. With regard to this question there is an additional table to submit—watering-places recommended by the Mines Department and now in course of construction.

Works in progress.

3426. Will you give us, then, some information of the works at present in progress that you have in your Department, stating their situation? The watering-places now completed and in course of construction are enumerated in this list. (*Appendices* U 1, 2. 3, 4.)

Difficulties from drought.

3427. Any remarks you like to make with regard to these papers we can take, referring them to the particular letter? You asked the question whether any works had fallen through owing to the lapse of the money vote. I think when it has occurred it has been chiefly due to the difficulty of getting the work done in consequence of the drought. The exceptional severity of the season has made it difficult to get contractors to undertake and complete works in the interior. The Works Department has during 1884 transferred six new watering-places and refitted four old ones, and they now notify twenty-five new and four old watering-places as ready for immediate delivery to the Mines Branch. In addition to these, thirty-eight watering-places are in a more or less advanced stage of completion, and twenty-five others have been recommended for construction during the current year, making with the forty-six now in charge of the Mines Branch, a total of 134 public watering-places expected to be completed during 1885. This, averaging the distance between each at what is considered the standard distance, that is 15 miles, provides watering-places for 2,000 miles of road.

Tanks on stock routes.

3428. These tanks are on the established stock routes? Yes, with the exception of a few in villages. The schedules which I have put in give the district, the road, the locality of each tank, the approximate capacity (when we have been unable to take the measurement, which has been the case in some instances, as some of them have continued full of water), the depth of the water, and the length of the road upon which they are situated.

Works plotted on maps.

3429. Have you any plan in the Department on which these works are plotted? No. I made application for a clerk to do this, and one was appointed for my assistance; but the Chief Inspector of Stock required him so much for the clerical service that, although the map is ready, it has not been plotted.

3430. Is the information you give sufficient to enable us to plot on the general map the position of each watering-place? Perhaps not with accuracy. I think a more completely plotted map can be obtained from the Commissioner and Engineer for Roads and Bridges.

Sketch maps.

3431. *Mr. Donkin.*] You have no plans of the present tanks, but only of the proposed ones? We have had several sketch maps prepared to accompany my report of 1880, showing the approximate position on an ordinary Colony map.

3432. Not one up to date? No, and many blunders were made in it. We have nothing charted up to date.

3433. *Chairman.*] It would be an advantage to have these works plotted out, if it has not already been done? Yes, of course; and I think you could get ample information from Mr. Bennett which would supplement my answers.

Sites.

3434. *Mr. Donkin.*] Have the sites been fixed in reference to the boundaries of the runs approximately? The selection of site is made on a reserve, or immediately after the site is reserved and proclaimed the surveyor connects. More recently, within the last two years, we have made many efforts to get special leases laid out and fenced, and many of these are now laid out.

3435. *Chairman.*] Who, in the first instance, recommends the position of the tanks? It is my duty to make recommendations for water supply where I consider it is needed, to inspect the sites when water supply is applied for by different persons, and then to submit the recommendation to the Minister for Mines for his consideration. On his approval being given the recommendation is forwarded to the Public Works Department.

Instrumental examination.

3436. Then all instrumental examination is undertaken by the Works Department? Yes. As to the site, the arrangement between the Departments is that the Mines fixes the approximate site: but, and especially in the case of tanks, the Works Department finally establishes the site and settles whether the exact site selected, or some other, shall be adopted, where water may be conserved at a smaller expense.

Reports on effectiveness of tanks. Caretakers.

3437. I suppose you have regular reports from each of these places with regard to the effectiveness of each tank? The present arrangement probably will be altered when the regulations are completed under the Public Watering-places Act of 1884. Now we have caretakers where the tanks are not leased, and they make a weekly report to the Inspector of Stock in the district, who is acting overseer of tanks and wells, and to myself. The new instructions will be under the Public Watering-places Act, but they have not formally been issued, pending the Minister's approval. The overseer is directed to visit each works once in six weeks, but more frequently if his presence is necessary.

Caretakers' reports.

3438. Does he, in these visits, ascertain the depth of water and the consumption? The caretaker reports the depth of water at the end of each week. To ascertain the consumption would require a delicate system of gauges, and we should have to check off the loss from evaporation.

Evaporation.

3439. And you have no check system for evaporation I suppose? I submitted a paper to the Minister, eighteen months or two years ago, requesting that some action should be taken to test the evaporation, and I was put into communication with the Government Astronomer, whom I met two or three times on the subject. He did devise an instrument for the purpose, and he was to inform me further on the matter. As yet I have not obtained any of these instruments.

3440. Do you think you could trust an instrument of this kind to the ordinary class of officers engaged in these inspections, to enable them to check their reports? I should have to entrust them to the men upon whom I could rely. We could not check the evaporation in the main tanks. My idea was to have an iron tank filled with water and submerged in the main tank.

Observations at tanks.

3441. Do you think you have men competent for that work? I could pick out fairly good men in each district. I do not see the necessity for carrying out the observations at all tanks; it would be sufficient if they were made at one in each district.

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3442. The delay in getting appliances has prevented you from getting this information? Mr. Russell, the Government Astronomer, was to inform me when they were completed.

3443. In their reports to you, do the men in charge refer to the construction of tanks, or make reference to what they may consider a better construction? That comes within Mr. Bennett's province. The new works I think have fulfilled very fairly the requisite conditions. In what is now called the standard tank the objections at first made have been got rid of. Standard tank.

3444. That is a rectangular tank with an embankment round it, and you throw the water from the inside into a trough outside? The water is served to stock from the new standard tank by lifting it with a Tangye pump, geared direct to horse power, by delivery pipes passing through the embankment into a service tank having a capacity of from 15,000 to 20,000 gallons. The water is then run out by a tap into a trough. Watering of stock.

3445. You think this is about the most effective system? Yes. If we had a larger rainfall, undoubtedly the better plan would be to make large excavations, let them fill, and allow the stock to be watered from them direct; but as the rainfall for several years has not given sufficient water from the catchment area to run into the tank I think it necessary to be careful of the water, and therefore advocate the service of water by troughing.

3446. *Mr. Donkin.*] Are orders given to keep the service tanks filled? Orders are given to keep the service tanks full always; it keeps them in better order, and there is a quantity equal to from 15,000 to 20,000 gallons of water ready to meet any emergency. Service tanks.

3447. Is there a man in charge of each tank? Yes. Where a tank is leased the tenant keeps a man in charge; where a tank is under Government charge, there is a caretaker. Tanks leased.

3448. *Chairman.*] In some tanks there is an approach with a slope of 4 to 1? There were three between Nyngan and Cobar, with direct approaches; they are now being fitted with pumps and troughing. The early tanks were with slopes of 1 to 1; now we have them with slopes of 1½ to 1. Approaches.

3449. Did you ever observe that, in watering stock in a sloping approach, a great deal of water was lost by being carried away in the fleeces? In my reports to the Department I have continually pointed out the loss of water from this cause, and stated that while a thirsty sheep may drink a gallon when admitted to the tank, it is impossible to say how much they carry out in their fleeces. I have seen several hundred swimming in a dam at one time. Loss of water.

3450. You have never tried to gauge the amount of soak-up by a sheep's fleece? No.

3451. You have come to the conclusion that it is a bad system of watering? Decidedly. I am in favour of watering by troughing, and that plan is adopted in all new works. The only question now is as to the adoption of steam pumps where there is fuel at hand. Watering by troughing

3452. *Mr. Donkin.*] In place of horse-power? Yes. In some of the new works the pumps are being driven by steam. Pumps.

3453. *Chairman.*] In face of the great difficulty with regard to labour in the interior, would it not be an advantage to get large excavations without so much finish to the slopes and angles? I think little advantage is to be gained by extreme finish if we get a containing capacity. I should prefer to see the money which is expended on great finish spent in increasing the depth, and so reducing the evaporation. Finish of slopes and angles.

3454. *Mr. M'Mordie.*] Do you think that finishing off the work is an expensive process? The embankments have to be trimmed and the slopes to be adapted to the exact batter. Expense.

3455. Is that an expensive process? Yes; it has to be done by hand-work.

3456. *Chairman.*] The other form could be given by the steam appliances in use? There I agree with Mr. Bennett, so far as steam-power has yet been used. We get very low slopes, and there is consequently an increased tendency for the water to splash up round the edges of the bank, and this especially in hot and windy weather.

3457. *Mr. Donkin.*] What are the slopes made by steam appliances? I think the Fowler slopes are 4 to 1. In a letter Mr. Doudney asked me whether I would consent to this if the Works Department did, in the event of his increasing the depth. I do not know what contract he entered into with the Works Department, but his view was to preserve slopes of 1½ to 1 side batter, and to increase them at the end. I replied that I saw no objection to that, provided he increased the depth, and these concessions being granted he would reduce the price; but as Mr. Doudney asked as much as other contractors, I did not see that much was gained, because we got a better finished work from the others. Work by steam appliances.

3458. Do any private individuals make the slope, 1½ to 1? Within the last two years I have had so much fieldwork that I have had little opportunity of inspecting private tanks. As it was impossible to carry forage, I have rarely been able to quit the main roads. Private tanks.

3459. Mr. Doudney says that Mr. Edols makes his tanks with slopes of 3 to 1? I think Mr. Edols was previously owner of Mr. Doudney's plant. I have gone carefully into the matter, and think that if you scale a slope of 1½ to 1, and another of 3 to 1, you will find there is an enormous difference. I find that our new tanks have stood very well with slopes of 1½ to 1. Slopes.

3460. Can you give in the standard specification of these tanks: I think you say one has been adopted? That must be obtained from the Works Department; it will then be exact. Standard specification.

3461. You recommend supply tanks, but you do not say anything about silt tanks—do you recommend that the water be directed at once into the main tanks? No. In all cases the water passes from silt tanks. I am in favour of a larger system of silt pits or tanks. The flood-water now drains into the silt-tank. In order to save expense there is but one silt usually, but unless rain falls rapidly in large volume it does not drain directly into the tanks. Silt tanks.

3462. What is the height of the embankment? It settles to about 12 feet. Embankments.

3463. Do you recommend generally embankments around tanks? I do. Seeing the necessity for an increased water supply, I recommended, in my report of 1880 or 1881, that we should have a portable engine on the roads to fill the embankments, or make arrangements with neighbouring squatters to keep them full in cases of heavy floods. There is 2, 3, or 4 feet of water now lying outside some of these tanks.

3464. In level country is any object served by these embankments? Yes, protection from wind.

3465. In reference to the tank 5 miles from Melrose, between Condobolin and Nymagee, Mr. Doudney said—"All round the tank I suppose the embankment is 15 feet high, and the water passes into the tank from the flume into the silt tank"; and when I asked if the tank was full, he said "No"? This tank has not been transferred to the Mines Department, and I have not seen it.

3466. *Chairman.*] I suppose there is a record of the cases of repairs to each tank, including cost in wages and supervision? That can be obtained from the Chief Inspector of Stock. Repairs.

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3467. Would it be possible to put in evidence the expense for one year? That can be done by the Chief Inspector of Stock. I find the only tank that I know on the line Condobolin to Cobar that Mr. Doudney put down—namely, the Tinda—was reported before the late rains to be two-thirds full. The return is from the Works Department, in reply to a minute from the Secretary for Mines.

Spoil. 3468. *Mr. Donkin.*] Do you consider that the spoil used in forming the embankment should be made to conform to a certain batter, and do you approve of embankments on level country? On perfectly level country there are no means of taking up the surplus water; but the spoil has to be removed, and in many cases I think it would be better removed into a horseshoe-shaped dam, to increase the water-level over the excavation. When the levels are taken, there may be found to be a slight depression to be taken advantage of. In any place where the catchment area is large, and the natural features such as to collect a quantity of flood-water rapidly in the neighbourhood, I believe in the high embankment, for the purpose of pumping in.

Slight depressions.

Slopes. 3469. There must be a slope towards all tanks? Of course.

3470. And it is usual to have the embankment round in the semicircular way you describe? Yes.

Batter of spoil. 3471. I understand you to say that, in putting spoil round the tank, in order to pump the outside water, it is not necessary that the spoil should have an exact batter? I think not, if sufficient dressing is done for neatness. Where the spoil has been spilt by the cart or motor, a great deal tumbles on the space between the excavation and the foot of the embankment. All that should be dressed off and carted away.

Effect of embankment. 3472. *Chairman.*] Do you not think that the raised embankments round rectangular tanks prevent the operation of the sun's rays upon the water to some extent? I think it saves the water from the effect of hot winds. I have seen the water in station tanks evaporate rapidly during a strong wind,—much more than it would do on the hottest still day. By the wind the water is dashed against the soil at the sides of the tank and absorbed and quickly evaporated, which must be added to that taken up by the rapid passage of the hot dry air. The embankment is a decided protection against the prevailing winds, which during the summer are generally from the south-west.

Height of embankment. 3473. Would it be an advantage to have an increased height for the embankment? I am not prepared to recommend an increased height; it would be a great increase in expense.

Trees. 3474. Have you made any attempt at growing trees or shrubs on the spoil banks? We had a suggestion from one officer to raise some grass on the embankments, and I have recommended to the caretaker to place some polygonum or cane-grass on the banks, but in the last three years this could not be done.

Aquatic plants. 3475. *Mr. Donkin.*] Has there been any attempt to grow the large Indian water-lilies? There has been no attempt to grow aquatic plants on the banks.

3476. In India they find these lilies serviceable in counteracting evaporation? I am aware of that, but it is questionable whether we should be able to grow them in the tanks, many of which are impregnated with gypsum. But I should add that at several tanks, where the water is impregnated with gypsum to such an extent as to be unfit for human consumption, a large amount of aquatic weeds have made their appearance, but they do not cover the surface like the broad-leaved lily.

3477. Would you recommend the planting of these lilies? If the experiment succeeded it would be valuable; but there is a great depth in the body of the tanks. I think they may be tried along the batters which are protected from stock. Some of the tanks in India are about the same depth as those here, and there the large-leaved lilies grow magnificently.

Erosion of banks. 3478. *Chairman.*] In India I think they adopt a system to prevent the erosion of the banks by the action of steamers, by growing a dwarf rush: I suppose the level in your tanks is not sufficiently constant for that? The level varies through evaporation and through consumption by stock. We may have 18 feet of water in a tank, and in a few months afterwards only 10 feet.

Silt. 3479. Does the cutting away of the bank materially silt the tank? Very much indeed.

Floating guard. 3480. Did it ever occur to you that a floating guard on the water would preserve the banks? I hardly think it would be practicable.

Protection of banks. 3481. You think that nothing in a simple way could be done to prevent the erosion of the banks? If it is found the present batter is too steep it must be slightly reduced, but I think that with the present form of tanks and embankments we protect the water from the action of wind to a large extent; and the stock being supplied from troughing, the wash of the banks will be reduced to a minimum. The bank will always wear away a little at the surface. Later I shall be able to give more information, as I find from experience how the excavations of the new tanks stand.

Planting of trees. 3482. Under the present supervision, would it be possible to have a few trees planted by the care takers on the banks, in order to test that plan? Yes. But the labour question is a difficult one. Hitherto the men have camped out at these tanks, but now it is proposed to erect huts for caretakers, and that will probably induce a better class of tenants or caretakers to undertake the work—men with wives and families. We have some men who, under the direction of the overseer, would give careful attention to any plants sent, and see that they were watered and cared for. I have seen some very permanent tanks in the dry parts of India perfectly protected by old trees on the top of the embankment. Our eucalypti would probably grow freely, but they absorb an immense quantity of water by the roots, so that the cure by this means would be worse than the disease.

Suitable trees. 3483. Could you ascertain what suitable trees are peculiar to the locality, for the purpose of testing this plan of protection? I could make the experiment at several of the works; for instance, there are three large tanks between Hay and Deniliquin, none of them having bitter water, so that the experiment suggested might be favourably made there.

Watering of trees. 3484. Would the men, do you think, undertake the extra duty of watering the trees whilst they were young? I think that at each of these works there are men who would take an interest in the matter, and see that the caretakers paid proper attention to the trees. I should be glad to carry out the wishes of the Commission at any time they choose to communicate with me, and I would give instructions, subject to the approval of the Minister, for the suggested improvements being effected.

Position of trees. 3485. *Mr. M'Mordie.*] It would not do to plant trees on banks intended to hold water? No, nor within the embankments—the earth there would be too soft; they must be outside, or in the neighbourhood of the silt tank.

3486. *Chairman.*] And they must be in the direction of the prevailing winds? Yes. Lilies and plants of that nature could be planted along the side of the excavation when the water was low.

Mr. H. A. Gilliat. 12 Feb., 1885.

3487. *Mr. Donkin.*] In speaking of the spoil being used for embankments to prevent the effect of winds upon the water, do you think that stakes and wicker-work would do as well? Of course you refer to tanks on great plains, and then the question arises as to where you are to get the wicker-work and timber. I have known cases in which slip panels had to be brought 30 or 40, or even 50 miles.

Stakes. Wicker-work.

3488. In the evidence with regard to the Tinda tanks, it appears that the contractor suggested the use of stakes and wicker-work? That was in a timbered country. There is a good fence suited to enclose tanks and embankments: a trench is dug, 2 feet 6 inches deep, stakes are put in it upright, and are well rammed in. When you could get the timber this does very well, and affords an admirable protection.

Drop fence.

3489. For enclosing, the drop fence is the best? A good deal depends on the saplings. A number of them are put in with a wire winding in and out to bind them.

3490. Did you state the number of tanks now in working order and in use? I gave the number of the works in charge of the Mines Department.

3491. Are those you mentioned in use and available? Yes.

Repairs and alterations. Pump.

3492. Many people from the back country report them as useless and not in working order? You refer probably to the Wilcannia Road. I recommended repairs and alterations at the whole of the watering-places of the Colony, consisting of troughing, service tanks, and pumping gear. A few of the tanks were fitted with M'Comas' water-lift. These were found in practice to get out of order. My view was to get the simplest gear, which was the double web, but that was disapproved of and the present Tangye pump was substituted.

3493. *Chairman.*] Is that pump effective? Yes, it is an excellent pump. With occasional repacking it will stand very well, and is sufficiently strong to bear the rough treatment of the men we employ.

Tanks in order.

3494. *Mr. Donkin.*] Then all the tanks are in working order? It was reported a few days ago that the Till Till tank was out of order. The alterations and repairs have not been completed, but stock and carriers can get water. The Boonoona is an old tank which was silted up very much, and the embankments have been trodden down, and the old water-lift had disappeared when I first saw it 1879. Stock are now admitted to the excavation until it is reconstructed. The 35-mile tank is dry.

Life of tank.

3495. *Chairman.*] The Boonoona tank is about fourteen years old—is that about the life of our tanks? I think the Boonoona tank, if repaired, would be as good now as it was originally, but the life of a tank depends upon the silt it collects.

Tanks out of order.

3496. *Mr. Donkin.*] Then there is some truth that some of the tanks are not in working order? If you mean that there are many places where stock cannot obtain water from them, I may say I do not think there is one, except when the supply has failed owing to the drought. Provision can be made to supply water at any of these tanks. For the last few years but little stock, comparatively, has been travelling.

Watering-places Act of 1884.

3497. *Chairman.*] Under the Lands Act of 1884 better provision, you think, is made for the administration of the watering-places? No, under the Watering-places Act of 1884. There were no means, prior to the passing of that Act, of protecting the works from trespass, damage, or pollution; we could not recover damages or punish the offender by prosecution; there was no statute under which a charge could be brought.

Wells.

3498. *Mr. Donkin.*] Have you anything to do with wells? Yes—with the inspection of them.

3499. But not the recommendation of the sites? Yes.

Drills Branch.

3500. Do you work in conjunction with Mr. Henderson? I have nothing to do with him. The Drills Branch have bored on lines of road where I recommended the use of the drill. After consulting with Mr. Wilkinson, the Government Geologist, I recommended boring on the line from Bourke, *via* Wanaaring, to Tibbaburra, which is near Mount Browne.

3501. The present road to Tibbaburra is *via* Wilcannia? Yes.

3502. Then at present there are three Departments dealing with water conservation—the Drill Department, yourself, and Mr. Bennett? There are three different branches in this Department.

Sites for tests.

3503. *Chairman.*] You indicate the site for tests, and Mr. Henderson carries out the practical work? I have only to indicate a line of road where I think boring can be practically carried out. The first line I indicated was that from Bourke to Tibbaburra, *via* Wanaaring; the second was from Collarindabri on the Barwon, by the 60-mile track, to Angledool on the Narran; the third was from Wilcannia to Thackeringa, near Silverton. Mr. Wilkinson, the Government Geologist, thought there was a fine promise of obtaining water on these lines.

3504. Can you say approximately when you recommended the road from Bourke to Tibbaburra? I think about three years ago.

3505. Did you recommend the route from Bourke to Goonery, on the Warrego? No; I was not consulted in the matter. The only recommendation which I made was that in all cases it would be desirable for the officer in charge of the boring party, if he had more than one plant, to commence boring as nearly as possible in the centre of his route. What was the object of boring at Gooney I did not see, because there was in that locality a spring on a Government reserve. I recommended that the borings should be 15 miles apart, which is adopted as the standard distance.

3506. You know that part of the route is closed? Yes, from Bourke to Tibbaburra.

Schedule of wells.

3507. *Chairman.*] One of the Schedules you produce gives all the particulars of wells? Yes; I think the bulk of the particulars you require.

Supply and quality of water.

3508. Can you inform us whether in all cases the water is permanent? There are many points to be taken into consideration with regard to wells. For instance, a well in one line of country where water is invariably found will be brackish. In those cases we generally found an inexhaustible supply; but where at the same depth the water is sweeter and otherwise better the supply often is smaller.

3509. Will you prepare for future examination all the information you can get on wells? Yes; I shall be very glad to do so.

Information on wells.

3510. If you could tabulate it and bring it under several heads—sinkings where good water is obtained, cases where it is or is not permanent—the information would come in a very useful form? Yes. I understand that Mr. Henderson is preparing a map on which all the known wells are laid down. I can give information about the lines of route, where brackish water is usually found, and where experimental shafts have been sunk.

3511. *Mr. Gipps.*] Did you reach the silurian rocks in boring? I had nothing to do with the boring, and do not know the character of the strata penetrated. On the Bourke line it is reported that in October last a depth of 448 feet was reached, and that they were in the cretaceous. I see that lately they have gone down 478 feet and are still going on sinking.

Mr. H. A. Gilliat. 12 Feb., 1885.

3512. *Mr. Donkin.*] After you have recommended a route to be opened you have nothing more to do with the work? Not until the completion of the work is notified; then I have to inspect and report upon it, for the satisfaction of my own Department.

3513. I think I understood you to say that these works are at present under three branches, and that under the new Act they will merge into one? No; the Public Watering-places Act of 1884 is for the administration and protection of these works, and also for legalizing the construction and maintenance.

THURSDAY, 26 FEBRUARY, 1885.

Present:—

MR. BARTON, M.P., | MR. FRANKLIN, C.E.,
MR. DONKIN, J.P., | MR. GIPPS, C.E.,
MR. M'MORDIE, B.E., C.E.

RUSSELL BARTON, ESQ., M.P., IN THE CHAIR.

Mr. Charles G. W. Lockhart called in and examined:—

Mr. C. G. W. Lockhart. 26 Feb., 1885.

3514. *Chairman.*] I think you were examined before the Select Committee of the Legislative Council on Mr. Brodribb's Pastoral Dams Bill. We wish to obtain any reliable information as to the water-courses which may be available for irrigation in the particular districts of the country in which you have had the greatest experience? I shall begin by making the rather startling assertion—and I dare say but a few will believe me—that there is a great deal more water than there need be.

Abundance of water.

3515. In the rivers? No; in the back blocks. The fact of the matter is that the squatters have had their runs overstocked. They have had too much water. They have lost sheep where there has been abundance of water.

Want of grass.

3516. *Mr. Donkin.*] The water would not kill them? No; they are killed through the want of grass. They seemed to think that if they once sank wells and obtained water they would be safe.

3517. Do you think that all runs are in that position? Most of the runs on the Darling.

Water conservation.

3518. Are you of opinion, then, that there is no need for a scheme of water conservation in that country? I say that in the case of many of the runs the lessees have done so much in that direction that there is no need for more to be done, if their works be legally protected.

3519. Do you not think that millions of gallons of water run to waste down the Darling, Murrumbidgee, Lachlan, and Murray? Even if that were not the case, you would be unable to keep any more sheep.

Irrigation.

No one is better acquainted than I am with the utility of irrigation. I have pumped water on to one or two acres of land, and have obtained the most astonishing results. I have irrigated a garden. I had in the first place to dig out the salt-bush soil to a depth of 2 feet; I then had soil brought in from the sand-hills. By irrigating that land I obtained wonderful results.

3520. But you think that if we kept all these rivers full not a sheep more could be kept? Yes.

3521. In good seasons there is plenty of natural food for sheep on these plains? Yes.

Sufficiency of present supply.

3522. *Mr. Franklin.*] You think that the present water supply is sufficient for stock: if there were a more abundant supply, would there not be room for a closer settlement for agricultural purposes? No.

3523. On the land between the Darling and the Lachlan would it not be of special advantage to make a more permanent supply of water by conserving the river waste? The squatters have done so much that I do not think there is any need to do more in that direction for their benefit.

3524. *Chairman.*] Do you know of any run on this side of the Darling on which sheep were lost for want of water this year? No. If that portion of the country will grow nothing but sheep, then I think you ought not to carry out any expensive scheme of conservation at the expense of the public. If you give the lessees a secure holding they will do all that is necessary themselves. If they do not do so, let them suffer the consequences.

Irrigation.

3525. *Mr. Gipps.*] Have you had any practical experience in irrigation? I have seen plenty of irrigation works in Scotland, and in this country I have had a pump on my own land.

3526. What was the nature of the soil you irrigated? Black soil.

3527. What was the character of the crops? Oranges, figs, and grapes, and all tropical fruits. Judge Forbes said that he had never seen such crops of oranges at Parramatta.

3528. What number of waterings were there? I watered my trees once every three weeks.

3529. What quantity of water did you use? I could not say.

3530. You found that you had always sufficient water in the driest seasons? Yes, I always had sufficient.

3531. What was the horse power of the windmill? About 4-horse power.

3532. How many hours consecutively did you pump? I used to fill reservoirs of 400-gallon tanks. Mr. Holding has a fine orangery at the junction of the Darling and Murrumbidgee.

Usefulness of water conservation.

3533. *Chairman.*] Then it is your opinion that it would not be advisable to go to any expense in conserving water, either for the purpose of irrigation or for stock purposes, between the Darling and the Lachlan, or between the Lachlan and the Murrumbidgee? Certainly not for stock purposes. The people are very well able to do it for themselves if their works be protected. I do not know about the growth of wheat, but we can get other crops to grow in a wonderful way.

Lucerne growing.

3534. Do you not think it would be worth one's while to grow lucerne? A friend of mine, Mr. Cresier, grows lucerne. He has a Tangye steam pump, and he saves himself an immense sum of money in his horse-feed.

Droughts and floods.

3535. Have you had much experience of the country between the Darling and the Lachlan? I have lived there on and off for the past forty-five years. I have seen three or four great floods and an equal number of great droughts.

Change of condition of country.

3536. *Mr. Franklin.*] Do you not think it would be possible to change the condition of some portion of this country by a constant supply of water, so as to make it available for agricultural enterprise? I do not think so. No one is more anxious than I am to see the country progress; but I do not believe that could be done. All that a man wants is a little lucerne for his horses and cows. How could you encourage a man to go out into this part of the country with a view to grow wheat?

3537. Could not some of the water be utilized for the growth of artificial feed? There would not be sufficient to grow artificial feed for all the sheep. Besides, if you give the sheep fair play they are always fat and well, and they are absolutely free from disease. Mr. C. G. W. Lockhart. 26 Feb., 1885.

3538. How many acres would you allow to the sheep? I would not keep more than a sheep to 5 acres.

3539. *Chairman.*] Then you do not think that any great benefit would be derived from the conservation by the State of a large body of water in this district? I would not spend any Government money there except upon watering stock routes or townships. Conservation of water for stock routes.

3540. *Mr. Franklin.*] What we wanted to find out was, whether it would be possible to conserve a certain quantity of water now running to waste, not for the feeding of sheep but for the growth of agricultural crops? I believe there is enough water running to waste to enable you to do so, if you could stop it. Conservation for agricultural crops.

3541. Do you think it would be a commercial success? That I cannot say.

3542. Would there not be a market among the run-holders—would they not buy hay to feed their sheep? No.

3543. Not at a cheap rate? I cannot imagine hay being grown at a rate sufficiently cheap.

3544. You know that in India vast herds are fed by artificial grasses? Where are you going to find in this Colony the men who will work like the patient Hindoos?

THURSDAY, 5 MARCH, 1885.

Present:—

MR. BARTON, M.P., | MR. GIPPS, C.E.,
MR. FRANKLIN, C.E., | MR. M'MORDIE, B.E.

RUSSELL BARTON, ESQ., M.P., IN THE CHAIR.

Mr. Harry A. Gilliat, Inspector of Public Tanks and Wells, further examined:— Mr. H. A. Gilliat. 5 Mar., 1885.

3545. *Chairman.*] You produce a number of papers? Yes; Annual Reports of my Department, and my evidence before the Select Committee of the Legislative Council on the Pastoral Dams Bill.

3546. What is the nature of the bank and bed of the river Lachlan near the head of the Willandra Billabong? I have never measured the banks of the river at the place indicated, but it is a narrow stream with precipitous banks with stiff upper clay. I have never examined them lower down to ascertain their strata. Banks of Lachlan.

3547. What do you understand the "summer level" to mean? I take it that it means the level at which the water stands on an average during a number of seasons. In the summer months the river Lachlan almost ceases to run, and the summer level is the height of the water in the large waterholes which remain. The summer level, as given at some of the large townships—Wilcannia for example—is absolutely unreliable. Summer level.

3548. Do you think that it would be practicable to construct a weir across the Lachlan, so as to send a large supply of water down the Willandra Billabong? I have not the least doubt of it. Taking the whole length of the Lachlan, with the exception of the Reed Beds below Oxley, I hardly know of any place where within a few miles you would not be able to place a weir. Weirs across the Lachlan.

3549. What would be the probable height and length of a weir across the river near the Willandra? I think that a suitable site might be selected there, but I cannot give the height to which it would be necessary to raise the weir to force the water into the Willandra, as I have not taken levels. About a year ago a paper written by the Chief Inspector of Stock was sent to me. That officer had an idea that by constructing a weir across the Lachlan, the Willandra might be flushed and the rabbits there be drowned. I thought it impossible under the present state of the law to so deal with the water of the Lachlan, but suggested that an excellent and practical officer living at Hay—Mr. John Keighran—should be asked to report on the subject. He reported that it would be practicable to put a weir across the river, but he did not think that the owners on the river below would allow the weir to stand. I think that a spot might be found where the width of a weir would not exceed 150 feet. The height I am not prepared to state, but it would not be very great I think. Dimensions of weir.

3550. Then no stupendous works would be necessary? Not at all.

3551. What dams have been made across the Willandra Billabong, and what are their approximate positions? To the best of my recollection there are five dams on Messrs. Whittingham's Willandra run up to the boundary of Mossgiel. There are two dams I think on Mossgiel run, one on Bundarra run, and three on Kilfera. I am not certain as to the number (if any) of dams on Clare run. The Willandra fills one or two lakes below that—Barney's Lake, and I think a small dam is on the lower side of it. Dams on the Willandra.

3552. Then there are twelve dams on the course of the Billabong? Yes, to the best of my recollection; I am not at all positive.

3553. *Mr. Franklin.*] What is the total distance over which the dams extend? I can speak approximately only. In wet seasons the billabong extends within from 15 to 20 miles of Lake Teryaweynya. Distance.

3554. *Chairman.*] You are quite clear as to the course of the Willandra Billabong? Yes. You cross it at Mossgiel-station, 3 miles beyond the township. It is well defined there. There is no well defined water-course after leaving the Merowie Creek until you reach the Talyawalka, near Wilcannia. The billabong is tortuous in its course; it has a northerly trend after passing Mossgiel. Course of Willandra.

3555. What is the general character of the country through which it passes? The lower part consists of fine salt-bush plains, in good seasons with plenty of grass and herbage. This class of country extends past Mossgiel; all open country, with little or no scrub. Character of country.

3556. For what distance? That I can hardly say. Following its course I should judge it runs through 80 or 100 miles of this country. After leaving Clare and passing into Kilfera the country becomes heavily scrubbed in places, and as the Teryawynya is approached the scrub gets denser, with occasional plains.

3557. Does the creek become shallower and its banks flatter as the distance from the Lachlan increases? It is a well defined creek to Mossgiel, and also on some parts of the Kilfera run, but after that it rapidly loses its formation. In some places it widens out in claypan swamps, and then reforms again. Bed of creek.

Mr. H. A. Gilliat. 5 Mar., 1885. Mossgiel. Banks. Dimensions of the Willandra.

3558. Is Mossgiel on the Willandra Billabong? Mossgiel station is quite close to the creek, and the township is about 3 miles south of it.

3559. For about what distance from the Lachlan are the banks of the creek well defined? Following its course, it is distinguishable as a large creek for certainly 80 miles.

3560. Can you give any idea as to the dimensions of the Willandra at intervals of 20 or 30 miles from its head—that is, where it takes off from the Lachlan? That can only be arrived at by taking a series of measurements. Where I have crossed the creek it is shallow and wide, the road being chosen to cross it in places where the banks are not steep.

3561. You have never examined the creek with a view to determine whether dams might be made across it? No, except in the neighbourhood of Mossgiel, where I once submitted, as an alternative for a tank, a dam across the Willandra.

Course of creek. 3562. Is the course of the creek very tortuous? Very much so indeed.*

Obstructions. 3563. Are there many obstructions in the shape of timber or silt-banks? Not many. There are old channels and by-washes, such as are usually formed on these flat plains where there is so slight a fall. There are also small islands formed by ana-branches running to and from the creek.

Distance reached by floods. 3564. Do you know what is the furthest point to which water has flowed in the Willandra from the Lachlan at flood-time? I have seen water from the Willandra fill a small lake at Kilfera head station.

3565. What distance, approximately, would that be from the Lachlan? Following the sinuous course of the creek, about 200 miles, I should judge. The distance from Kilfera to Teryawynya Lake is about 72 miles in a direct line.

3566. What is the average width and depth of the Willandra at its head? I cannot say, as I have not made any measurements.

Water running back. 3567. When a flood occurs in the Lachlan, and the water runs along the Willandra, does the water flow back into the Lachlan in the event of the flood subsiding rapidly? I can give no information about that. I have heard it said that there is a back flow. I have never been at the entrance of the Willandra at a flood-time.

Natural depressions. 3568. Do you know whether along the course of the creek there are any natural depressions in which large quantities of water might be stored? There are a number of lakes, some of which have been reserved, I believe; they are either portions of the creek where it spreads out or are near to it. There is Barney's Lake, on Clare Station, and further on there is Willpania Lake. There are several boxes or clumps of timber surrounding lagoons along the course of the Willandra, and these boxes are filled by overflows from the creek. There is a box about 9 miles from Mossgiel, where, in 1882, I noticed that a number of Chinamen had established a large potato garden.

Water storage. 3569. If water storage on an extensive scale can be carried out on the Willandra, do you think that the owners or occupiers of land adjacent could make use of the water for irrigation? That opens up a large question. I doubt whether a sufficient quantity of water could be got from the Willandra for irrigation purposes, except on a very small scale. A quantity of water might be stored by diverting into tanks for the use of stock.

Storage of Darling flood-waters. 3570. Do you think that it is practicable to store large quantities of the flood-waters of the Darling in the lakes and large natural depressions near its course? I think so. There are many places where the flood-waters of the Darling which now run to waste in all directions might easily be stored, particularly in the series of larger lakes on the lower part of the river.

3571. Will you describe and point out on the map the lakes which you think might most easily be utilized for such storage? I am simply offering a general opinion; I should not like to name any particular places, as careful surveys will have to be made before forming a definite opinion.

3572. But, from your knowledge of the river and the lakes, you think that there are a number of lakes where water might be stored? Yes. I can speak more confidently of the lakes on the Paroo, which I have marked on the map, and of which I have made a rough horseback survey.

Banks of lakes. 3573. Are there any of the lakes with banks of sufficient height to hold water up to the highest flood-level of the Darling, or nearly so? I do not think so. I think that they will all require more or less artificial embankments to make them retain water to such a level.

3574. Have you in any case ascertained whether, by the construction of dams provided with sluice-gates, the water can be permanently stored in these lakes? I cannot answer this question, as I have not taken any measurements. The only locality to which I have paid particular attention has been on the Lachlan, with a view to fill Lake Cudgellico with water.

Country between Lachlan and Darling. 3575. What is the general nature of the country between the Lachlan and the Darling? Taking Hillston as the initial point, and thence to Cobar, and thence to Louth or Bourke, leaving Hillston, the country rises until the hills are reached, and from there it gradually descends with a general westerly slope. This continues to a point beyond Cobar, the country being sandy and scrubby, and in places heavily timbered. From a point near Louth, about 20 or 30 miles back from the Darling, commences the ascent of Rankin's Hill Range, which follows generally a south-easterly course for a few miles, then trends south, and then westerly again, giving a gradual fall westward. There is a belt of mallee, which continues north and north-west from 30 miles north of Hillston until it crosses the road between Wilcannia and Booligal, about 30 miles from the former township. This area is interspersed with really magnificent salt-bush and grass country in the eastern portion. Falling to the westward until you get on to the great salt-bush plains, much of the country nearest to the Darling, and some miles back from it, is covered with heavy scrub. Most of it is edible, sufficiently good to keep sheep alive and to fatten cattle. In 1884, I saw cattle fed on this scrub which were as fat as if they had been in first-class paddocks. The general character of the flat salt-bush plains continues away westward until you reach the plains beyond Kilfera and Clare. Then the character of the country gradually changes and gets worse and worse. Taking the corner contained within a line from Menindie down to Euston, down the Murray to Wentworth, and thence to Menindie, the land is about the worst in this part of the Colony—poor, inferior land, covered with mallee and sand. This poor country forms a triangle, of which the Darling and the Murray are two sides, and a line between Menindie and Euston the hypothenuse. As a rule, the Darling River frontages are of indifferent quality; but going back from the river the country improves and gets richer.

3576. *Mr. Gipps.*] What is the character of the soil in the triangular area to which you have referred? Sandhills intermixed with stiff white clays.

3577. Is it subject to floods? In some places. 3578.

* Note (*on revision*):—*Vide*, for a portion of creek, run map, county Mossgiel.

Mr. H. A. Gilliat. 5 Mar., 1885.

3578. *Chairman.*] Do you think that there is any chance of its being found practicable to convey flood-waters towards Cobar from the Lachlan or the upper part of the Bogan? It may be possible from the upper part of the Bogan. The levels which I have taken have been merely with aneroids, and are subject to correction; but four or five observations which I made showed that Cobar is from 435 to 450 feet above the level of the river Darling at Bourke. Your engineer tells me that levels which he has taken accord with mine to within 10 or 15 feet. Conveyance of water towards Cobar.

3579. Then you think that there is more chance of bringing water into the Cobar district from the Upper Bogan than from the Upper Lachlan? I think the Upper Bogan has the higher elevation of the two. I do not think that you could get water from the Lachlan to Cobar.

3580. Do you know of any channel besides the Willandra in which flood water can be conveyed far into the interior part of the country on the Darling and Lachlan? No doubt by the erection of weirs the Merowie or Box Creeks could be filled with water in the same way as the Willandra. Back from the Lachlan, on the Walgeirs run, there is a fine group of lakes, which might be filled, perhaps, by water brought from the Lachlan through the Merowie, but many of these, I think, have been alienated. Merowie and Box Creeks.

3581. Do you know of any sites suitable for reservoirs on a large scale between the Lachlan and the Darling? I cannot reply to that question, as I have not made any surveys. Reservoirs.

3582. Do you think that such sites may be found? I have not the least doubt of it. There is a gradual rise in the country about 30 miles after you leave Mossgiel. I left that place the day after a 3-inch fall of rain, drove 35 miles by a back track running parallel with the main road. For a number of miles the water was flowing slowly towards the west, and was above my horse's fetlocks until I began to rise on the opposite slope. This circumstance leads me to the conclusion that in that part of the country you will find places where large quantities of water may be stored. Then, about 30 miles from the Willandra Billabong, following the road northerly, there is a curious series of low red clay and sandy hills, from which I think there must be a large amount of drainage on to the lower country. Then following that line to the east and then to the north-east and north, there are numbers of clay-pan swamps, indicating depressions. Country about Mossgiel.

3583. What is your opinion of Lake Cudgellico as a storage reservoir for flood-waters? It is invaluable. I think that an inexpensive weir in the Lachlan and a trap in the creek would retain water permanently in the lake. Lake Cudgellico.

3584. *Mr. Franklin.*] Is there any outlet from the lake? I am not aware of any, except the creek which is both the affluent and the effluent.

3585. *Chairman.*] Have any efforts been made to retain water in the lake? I have heard that a trap was put in the creek, but it was washed away.

3586. Do you think that the storage capacity of the lake would be materially increased by a trap being placed in the creek? Undoubtedly. Storage capacity.

3587. What is the quality of the land near the lake? It is fair pastoral country; it is principally open box country, and much of the land would be very good for agricultural purposes, if there were plenty of water available. Quality of land.

3588. If there were plenty of water, do you think that irrigation would be resorted to? That I cannot say. If the water were there, and it would not be too expensive to get it on to the ground, no doubt people would avail themselves of it. Irrigation.

3589. Do you know anything about the opinions of the land-owners on the subject of the improvement of the lake? No; I have not had an opportunity to speak to them respecting it.

3590. *Mr. Franklin.*] Is the whole of the lake included in one run? I think not; but I am not sure. There has been a good deal of selection and mining about there. In fairly good seasons there must be a considerable fall of water from the Corapara Ranges towards the lake; I fancy there must be small creeks running into it. Water from Corapara Ranges.

3591. *Chairman.*] In the country west and north of the Darling will you describe and point out on the map the places where you have had experience of the result of well-sinking? I have some memoranda which I made on the occasion of my visit to Mount Browne, to report on the means to be adopted to avert another water famine there. These memoranda are as follows:—

Memoranda on wells beyond the Darling.

Mount Stuart Block, near the Queensland border. Thompson's well, 5 miles south-west from Tippaburra, 134 feet deep, ample supply of water, which rose 37 feet in shaft, good drinking water. Terawinda Plains Block, No. 2, Speed's well, 22 miles S.E. from Tippaburra, 129 feet deep, ample supply of water, which rose 20 feet in the shaft, good drinking water. Scott Bros., Hermitage Block No. 2, 4 miles N.W. of Tippaburra, 130 feet deep, 25 feet bore at bottom of shaft, 8 feet pure water in the bore, said to be the best in the district. Scott Bros., Hermitage Block, 14 miles from Tippaburra, shaft 190 feet deep, bad water and the supply only 200 gallons per diem. Hermitage No. 2, shaft put down by miners at Tippaburra, 200 feet deep, water rose 20 feet, considered ample supply. Chinamen's well, about half a mile from Milparinka, on the Evelyn Creek, about 150 yards from bed, 65 feet deep, two drives of 10 feet each, supply under 70 gallons per hour, probably soakage water. Government well, Milparinka, about a mile north of the town on the bank of the Evelyn Creek, also soakage water. Pimpeira, C. Butcher & Co., 130 feet down (dry), 48 feet of clay (yellow), 20 feet of drift-sand (white), 20 feet of sand (yellow), 30 feet of dark-red ironstone, pebbly drift full of quartz lumps; dark-red pebbly drift, all water-worn, then a layer of white clay 4 inches thick, then dark heavy drift, quartz pebbles; left off in light-yellow sand (dry). Whampah waterhole, probably the finest in the back country, 2½ miles long and 26 feet deep; situate 2 miles on our side of the Queensland border.

I called attention to the necessity for immediately reserving the waterhole, and having a township reserve about it. It is a very valuable supply of water, and the creek itself might be utilized still further, as there are several other waterholes in it which, by being improved, might be made good use of. The Whampah waterhole is situated on the main road from Tippaburra to the Queensland border. It is capital stock country in the locality.

Sturt's Depôt, Glen Run, well, 80 feet deep; rise, 40 feet; first-class water; supply estimated at 10,000 gallons per diem, that is 1,000 gallons per hour for ten hours' bailing.

The peculiarity of this part of the country is that the soil is very firm, except where there are frequent ridges of sand running N.E. and S.W. It is firm pebbly soil, carrying salt and cotton bush, and an inch of rain will cause the creeks to run for 70 miles, while in much of the Darling country it takes 3 inches of rain to fill a tank. Evelyn Creek runs nearly 80 or 90 miles after a fall of an inch and a half of rain. The other creeks run in the same way.

Mount Browne well, 190 feet, fresh water, not yet completed. Rocky Glen well, 200 feet, very small supply, but good drinking water. Rocky Glen, 310 feet, dry. Blackwood No. 6, 100 feet.

This well was unfinished at the time when I was there, but I have since heard that it has been completed, and that a supply of good water was struck.

3592. *Mr. Gipps.*] What is the character of the strata in the wells? Cretaceous. 3593. trata.

Mr. H. A. Gilliat. 5 Mar., 1885.

3593. What is the bottom composed of? I do not know. Some of them have obtained water in the drift below a strata of pipe-clay.

3594. *Chairman.*] Is there a porous gravel bed at the level to which the water rises, through which the water escapes? Not in any of these wells that I have examined. The water is found in the cretaceous beds. There are a number of granite bows; water is not found anywhere in them.

3595. Do you think that the water in the wells to which you have referred stands at the same level in all of them? I think so.

3596. Is there any difference in the height of the water at different seasons? Not that I am aware of. There is another well on Manaly block, which was put down in a good season by the then lessees—Messrs. Geyer and Hamilton. Having plenty of water in the creek at the time they did not make use of it, but during the first dry season they sent a number of sheep to the well, with the result that they lost 5,000 or 6,000, the water being poisonous. The water has not to my knowledge been analyzed to ascertain what the poisonous element is.

Wells in Western District.

3597. Can you give us any information with respect to wells in the Western District? On Mombah station—the property of the Sir John Elder Pastoral Company—one of the largest in the Colony, they have gone in largely for wells fitted with steam pumps. The manager forwarded me a tracing showing the positions of the different wells and the supply of water in them, but the document was destroyed in the Garden Palace fire.

Under-ground supply.

3598. What are your opinions generally regarding the source, quantity, depth, and direction of flow of the under-ground supply west and north of the Darling? I do not think that we are possessed of sufficient data to enable us to form any opinion on the subject. I have not seen anything to indicate the presence of underground streams. I have made no tests to ascertain whether such streams exist, but I purpose this season, if possible, to make a test, by selecting a spot where there are a number of wells in close proximity to each other, and staining the water in one of them with aniline dye. If there is any under-current, it may be indicated by the appearance of the dye in one of the other wells.

Wells between Lachlan and Darling.

3599. Have you had any experience of wells in the country between the Lachlan and the Darling? There are a number of wells on different stations near the Booligal and Wilcannia Road; the average depth of that line is about 120 feet, and the water usually brackish, in some cases unfit for stock. An exception occurs at the Jumping Sand Hill, a Government well, about 20 miles south of Mossgiel. Here the water is so sweet that tea made with it requires no sugar.

Under-ground supply.

3600. What is your opinion respecting the under-ground supply in that part of the country? There is an ample under-ground supply, and my belief is that the water gets its saline properties from the strata in which the wells are sunk. The strata are heavily charged with salts. In 1879, I tasted water from the Holy-box well; up to that time it was so salt that no animal would drink it. I collected from 20 to 30 lb. of clean crystals of salt which had formed around the service tank and troughing. I recommended that the well be condemned, and forwarded the statements of people who had resided in the locality from the time the well was sunk; they all agreed that from the very first the water had been undrinkable. At the end of 1883, a tank was being constructed in the locality, and the contractor not having any supply of water for his horses tried that in the well, and found that the animals would drink it; on making further inquiries, I found that there was much more water in the well than there was in 1879; this I attributed to surface drainage. The water was baled out of the well, and that which came in afterwards found to be good enough for stock. There are several other wells in which the quality of the water has improved in the same way.

Saline beds.

3601. *Mr. Gipps.*] Do not you think that the presence of salts in such large quantities in the strata proves that there is no under-current? That is my opinion; I do not expect to find any under-current where

Under-currents.

the water is so heavily charged with salts, but I expect to find good supplies of fresh water below the level of this saline bed.

Legislation.

3602. What is your opinion regarding the necessity for legislation on the subject of water-rights? I think that it is most important—more required than almost any other legislation.

3603. Will you state concisely what in your opinion ought to be the nature of such legislation? I have given my opinion as clearly as I could, in the following addendum to my evidence before the Select Committee on the Pastoral Dams Bill:—

1. Riparian rights.—It may be remarked that any contemplated legislation on this subject should perhaps embrace the anticipated requirements of two classes, viz., Crown lessees, and the owners of the banks of streams. In the first case the Crown is the riparian owner; in the second, the banks have been alienated, and the rights are vested in the proprietors. The latter class is largely represented upon the streams and effluents between the Murray and the Murrumbidgee, to a considerable extent upon the Upper Lachlan, on portions of the Lower Lachlan, the Bogan, the Macquarie, the Martheguy, Castlereagh, Namoi, Gwydir, and Narran, and occasionally upon the more western rivers and streams; on all these latter, however, the riparian rights remain chiefly with the Crown.

2. The height of weirs.—To prevent infringement of the rights of riparian owners, the height of weirs will perhaps require to be regulated by the average flow of the stream in which they are constructed, and to a considerable extent by the position of the storage reservoir. Weirs storing the impounded water within the banks or in the bed of the stream should not perhaps exceed the height sufficient to retain that proportion of the minimum flood of the stream allotted to the weir. When the storage reservoir is without the banks, and the water to be impounded is conveyed to it through a race, without serious loss from soakage, evaporation, or waste, the height may be increased; but in such case the weir should be furnished with sluice-gates, to discharge the surplus supply when the impounding area is filled. In some streams where a minimum flood might run down 50 miles, the ordinary dams placed on the upper stream would impound and waste so much of the flow that it would not reach half the distance. Overfall weirs, with a supply allotted to each in proportion to the height of the flood, would obviate this curtailment of the riparian rights. But this necessitates an agreement, based upon the average of the annual floods, of the impounding right to be allotted to each weir. In streams similar to the Castlereagh, where even after prolonged droughts the waters continue to flow beneath the sand, the weirs may be of different heights, regulated to prevent water wasting over the banks; as after banking up to the level, the surplus water will flow over the weir, to follow its course beneath the sand until intercepted and backed up again at the next weir below. Again, streams exist that for many miles of their course are mere water runs, almost indistinguishable as a watercourse in dry weather, such as the Merri Merri. In the N.W. of the Colony are frequent creeks and small streams, with well defined beds or channels conveying flood-waters for many miles, eventually wasting over great clay-pan swamps or shallow lakes. The varying conditions of these streams will perhaps have to be considered.

3. The management of streams upon which weirs may be constructed.—It may be admitted that, in the absence of exact data upon which the calculations should be based, reasonably approximate ones may be arrived at by competent men. Upon permission having been obtained from the Minister for the construction of a weir, it

may

may seem desirable that two arbitrators should be appointed—one to represent the Crown, and one elected by the riparian owners—to regulate the height and the proportion of the flood-water that may be allotted to the weir, and also the dimensions of the impounding area. Or, each stream, on application from the majority of of the owners or lessees, may be constituted a Water Trust, with a Chairman appointed by the Crown, and an elective Council, with power to regulate these questions, and within certain limits to collect rates, either by assessment or upon the proportion of water stored at each weir. Or, Local Courts might be constituted under a Local Government Bill with similar powers. Mr. H. A. Gilliat. 5 Mar., 1885.

4. The distance between weirs would be regulated upon the same averages of flow, or, in other words, by the proportion of the average annual flood-water to be distributed among the riparian owners of the stream.

5. Pollution.—With respect to the pollution of impounded water, if the storage reservoir is within the banks of the stream the provisions against it can hardly be too stringent. The washing of one or two hundred thousand sheep may involve soiling water of owners below for years, of short supply, with no heavy flow to clean out storage reservoirs. Where the reservoir is beyond the banks, and filled by a race from the weir, the restrictions might be modified to admit of sheep-washing.

6. Construction of weirs.—With respect to the construction of overfall weirs, although in favour of a large discretion being allowed in the selection of material, great misapprehension appears to exist as to their cost relatively with the earthen dam commonly adopted in this Colony. Timber crib weirs, similar to those built by the timber men of Maine and Canada when the spring freshes are insufficient to float their winter logging down, can be put on any of our timbered streams at quite as low a cost in the long run as the majority of the earthen dams. Over a large portion of the Western Districts gypsum is found in large deposits; this, calcined and mixed with sand and water, and run into moulds, where it sets in a few seconds, would make a cheap and durable facing for weirs. Only when it is shown to the satisfaction of the Minister that suitable material cannot be obtained for the construction of weirs should the earthen or any dam be permitted, and to meet such cases the law regulating the by-wash might be carefully considered, with a view of correcting this most fruitful source of waste and infringement of riparian rights, and may perhaps usefully include regulations for its dimensions and construction.

In conclusion, there can be no question of the urgent importance of legislation which will encourage and promote the widespread storage of water, but at the same time it should be so thoughtfully directed as to procure for the Colony the lasting benefit of its being carried out on sound and economic principles.

THURSDAY, 19 *MARCH*, 1885.

Present:—

Mr. BARTON, M.P.,	Mr. GIPPS, C.E.,
Mr. DONKIN, J.P.,	Mr. LYNE, M.P.,
Mr. FRANKLIN, C.E.,	Mr. MURRAY, M.P.,

Mr. M'MORDIE, B.E., C.E.

W. J. LYNE, Esq., M.P., President, in the Chair.

Mr. Arthur Blomfield, of Murranumbla, examined:—

Mr. A. Blomfield. 19 Mar., 1885.

3604. *President.*] Where do you reside? At Buckley's Crossing, Cooma.

3605. Are you acquainted with the country in the neighbourhood of Snowy River and Kiandra? Yes, I have been for many years.

3606. Have you heard that a survey is being carried out with a view of ascertaining whether it is possible to divert the waters of the Snowy River into the Murrumbidgee? I have seen it mentioned in the papers.

Snowy River.

3607. What is the nature of the country between the head of the Snowy River and the head of the Murrumbidgee at Stack's Creek? That is close to Cooma. The country is composed of heavy ranges and plains all the way between there and Kiandra, with belts of timber.

Nature of country.

3608. Kiandra is on the Murrumbidgee? No; it is on the Eucumbene.

3609. Have you any knowledge of the country between Eucumbene and Stack's Creek? Yes; it is timbered ranges and open plain, partly granite and partly trap rock.

3610. Is it very rough country? In some parts it is rather hilly.

3611. Do you consider that it would be possible without any very large cost to bring the water through that country from Eucumbene to Stack's Creek? I think it would be very practicable.

Division from Eucumbene.

3612. You have never taken the levels? No.

3613. Do you think that they would be favourable? Yes; it is rising ground all the way to Kiandra. The water would come down with tremendous force.

3614. What distance do you think it is from Eucumbene at the point at which the water would have to brought down to Stack's Creek? I fancy you would have to bring it from a station called Eucumbene. The other part is too rough and mountainous, and the fall would be too great. I think that by following the valley a sufficient fall could be obtained. The force of the water would be tremendous.

Distance to Stack's Creek.

3615. If you struck the river at that point, would it take in any of the large tributaries? Not that I know of, but there are a great many small streams—never-failing ones—which run into it.

Small streams.

3616. I suppose it would take a great quantity of the Snowy River water? Yes; and at times that river swells very much, particularly in the spring, when the snow is melting, and after a storm.

Quantity of water.

3617. From your knowledge of the stream, is it tolerably continuous? Yes.

3618. From the melting of the snow? Yes.

3619. At what time principally does it melt? In spring.

3620. How long does it last? The heavy floods last a day or two generally, and occasionally the river overflows its banks.

Floods.

3621. How long does the melting of the snow last? During the whole of the spring and a great part of the summer. There is snow on Mount Kosciusco now—there always is a little to be seen. The hills and the swamps about there are so spongy that the ground is full of water.

Melting of snow.

3622. I suppose that in the neighbourhood of the Snowy River the water, instead of running away all at once, gradually soaks out? Yes; and it keeps up a constant supply all the year round.

Constant supply.

3623. What I want to know is, whether a sufficient quantity of water runs down the river in December, January, and February to be of great benefit in any ordinary year, if turned into the Murrumbidgee, so as to keep a constant stream in that river? Undoubtedly.

3624. All through the summer? Yes.

3625. *Mr. Barton.*] The great bulk of the snow melts on the hills in about eight or nine weeks? It all depends upon the rainfall.

3626.

Mr. A. Blomfield. 19 Mar., 1885.

3626. Do not the miners there reckon on having water for nine or ten weeks from the melting of the snow? Yes; but there is snow still on the hills—there is always snow there; I have seen 10 feet of snow at Christmas; that is on the eastern side.

Duration of melting of snow.

3627. *President.*] Can you tell us the distance the water would have to be carried in bringing it from the Eucumbene to Stack's Creek? I should say somewhere about 20 miles.

Distance to Stack's Creek.

3628. Do you think it would be practicable to divert the water from the Eucumbene into the Murrumbidgee by a more direct and less costly route? That is a difficult question to answer—it is a question for a surveyor.

3629. How far is it from the Eucumbene to Stack's Creek, the way the water would have to come? I hardly know; I suppose about 25 or 30 miles. I can ride out there in half a day.

Distance Eucumbene to Murrumbidgee.

3630. How far do you think it is by the most direct route from Eucumbene to the Murrumbidgee at the other place you mentioned, without coming to Stack's Creek? It all depends on what point you would start from.

3631. Can you give us any idea? Not without knowing the route.

3632. I suppose you know the whole of the country up there? Yes, pretty well, between the mountains and Cooma.

Storage of water.

3633. Do you know of any spots which offer natural facilities for storing water? No, I could not say that I do, not being sufficiently acquainted with what would suit for that purpose.

Natural basins.

3634. I mean natural basins, where with a moderate expenditure water could be stored? An enormous quantity could be stored in and near Kiandra. Large quantities are stored there for sluicing.

3635. You do not know any particular spot, such as what they call the Gulf? I have not been at the Gulf. I fancy that the country about Four-mile, near Kiandra, would suit.

Inspection of routes.

3636. *Mr. Franklin.*] Do you think this Commission could gain any advantage by making a personal inspection of the alternate routes? I think so. There is nothing like looking at the place for yourself.

3637. Which would be the best place for assembling? Cooma.

3638. How can that be best reached from Sydney? By train to Bungendore, and thence by coach. If it was known that you were coming, a number of people would meet you and drive out with you to Kiandra, where you would have to take pack and saddle horses.

3639. Which is the best season for making such a visit? About the beginning of January.

3640. Is it not practical later than that? You can go this month or next, but I should not advise you to go so late in the season. There have already been frosts even down on the plains.

3641. As it is a rough country, you would not recommend that a very large party should go? It is not a rough country; it is a very pretty country, presenting a mixture of open and timbered land.

3642. Could all the appliances for a camp be obtained at Cooma? Yes. I could supply a couple of pack and a couple of saddle horses, and we could wire in advance for provisions.

3643. *Mr. Donkin.*] How long did you say it takes to go from Bungendore to Cooma? Twelve hours or less.

3644. Do you think you could get good evidence by visiting Cooma? I think so.

River at Eucumbene station.

3645. Did you say that the river at the Eucumbene station is a large stream? No, a small one, but it never ceases.

Discharge.

3646. *Mr. Franklin.*] You have never gauged the discharge? No; the country is so well watered that we do not take much notice of the rivers.

3647. Then you do not really want the surplus waters, so far as agricultural and pastoral purposes are concerned? We do not; we have sufficient spring water.

Utilization of waste water.

3648. *President.*] Do you consider that the waters of the Snowy River would be of any service on the Lower Murrumbidgee? I fancy that they would. It would be a national benefit to utilize the water which is now being wasted.

3649. Do you know the Snowy River down to the sea? No; I have been along the river to just below the Victorian border.

Country on Victorian side.

3650. Is there any large amount of good land on the Victorian side? No, it is wretched mountainous country.

3651. Then the water going through there could not be utilized in Victoria? Not for many miles, except to keep open the channel to the sea.

Providence Flat.

3652. *Mr. Gipps.*] What is the length of Providence Flat? I suppose that from the township down to Russel's it is 2½ or 3 miles.

3653. What is the breadth? That I could hardly say.

3654. But it is a large area? Yes.

Breadth of Eucumbene.

3655. What is the breadth of the Eucumbene at Providence Flat? It is very narrow indeed. At low-water-time it is not more than 10 yards wide, and at high-water-time about 50 yards.

Depth.

3656. What is the depth of the water in flood-time? I could not say.

3657. Could you cross it in a buggy? No; there may be 30 feet of water running down at such times.

3658. What is the average depth in summer-time? From 2 to 4 feet.

Current.

3659. What kind of current is there? It is strong, and the water is very clear.

Country near Mount Kosciusco.

3660. Do you know the country in the immediate vicinity of Mount Kosciusco? I have not been to Kosciusco.

3661. Have you crossed the Snowy River in the vicinity of Kosciusco? Yes.

Examination of streams.

3662. Is it a large river? No, a small one, as big as the Eucumbene.

3663. Do you know the Burrangobuge River? I may have crossed it without knowing the name.

3664. Would you not advise the examination of all these streams? I would strongly.

3665. *Mr. Donkin.*] Would you advise the Commission to visit that part this month or at the beginning of next year? It is getting rather late to attempt it this year. The Surveyor-General and his daughter went out in January, and were kept there three days.

Rain-gauge.

3666. Have you kept a rain-gauge? No; but I should like to get one.

THURSDAY,

THURSDAY, 31 *MARCH*, 1885.

Present:—

MR. DONKIN, J.P., | MR. LYNE, M.P.,
MR. M'MORDIE, B.E., C.E.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. James M'Laurin called in and examined:—

Mr. J. M'Laurin. 31 Mar., 1885.

3667. *President.*] Where do you reside? At Yarra Yarra.
3668. That is in the Germanton district? Yes.
3669. How long have you been a resident of the Colony? So long that I almost forget—about forty-seven years.
3670. In what part of the Colony have you resided the greater part of that time? Principally in the Murrumbidgee district—what is called the old Murrumbidgee district, between the Murray and the Murrumbidgee.
3671. In what part? I have been for a considerable time, fifteen or twenty years, on the Edward.
3672. Had you any station property there? Yes.
3673. I believe you were the first discoverer of the Edward River? I believe I was. Edward River floods.
3674. About what year was that? I think it was in October, 1840.
3675. Have you had any experience of large floods? Yes, I have seen a great many floods on the Murray and Edward.
3676. What extent of country is flooded by the Edward and the Murray? The Edward takes its rise out of the Murray—for it is a branch of the Murray you may say—about 20 miles above Deniliquin, and runs for about 150 miles, after which it joins the Murray again. The Tuppal is another branch, which runs out of the Murray a little below Tocumwal. A little above Old Tocumwal there is a sandy creek which runs out of the river. Mr. Mooney made a cutting into the Tuppal Creek below Tocumwal. Cutting at Tuppal Creek.
3677. Who was Mr. Mooney? He was the owner of the Barragama station.
3678. And he made a cutting from the Murray into Tuppal Creek? Yes, a cutting something like that of the Yanko, only a short one. The country is lower some distance back than it is on the banks of the river.
3679. *Mr. Donkin.*] Where does the main body of water run out? To Jarapna Creek. I think the Gulpa Creek is the oldest channel course; it runs deep the whole way, until it comes into the Edward at Deruliman, where Boyd and Company formed their head station before they formed Deniliquin. A great many creeks run out of the river Murray, and the whole of the country, excepting the sand-hills, is lower than the river banks. Gulpa Creek.
3680. *President.*] That is near the outlet of the Edward River? Yes, it is all lower up to about somewhere near Baruga station. My reason for saying so is this: that in flood-times a rise of an inch on the river bank gives a rise of 3 or 4 feet some distance back. Some thirty-five or forty years ago the Edward ran into swamps for about a mile, and eventually formed a creek. When Captain Sturt went down the Murray to Adelaide he could not get along for the swamps, and he cut a place to get his dray to the river, to cross to the Victorian side. That cutting, which I call the Broken Bank Creek, became larger year by year, until it formed a deep channel for about a mile and a quarter down the Edward River: that is the reason why the Edward River rises so much earlier now than in years gone by: the action of the water has made a deep channel. When I first saw the Edward it was impossible to get a steamer up it, but now a steamer can be taken right up into the Murray. Country near the Edward. Broken Bank Creek.
3681. *Mr. Donkin.*] Is navigation possible now from the Murray up the Edward to Deniliquin? Yes, in flood-time. Navigation.
3682. *President.*] To what extent was the country flooded during an ordinary flood forty years ago? You see here on the map where the Tuppal Creek flows out from the river. Well, the Tuppal may be flooded for a mile or two on the north side, but there is a higher strip of land between that and the Billabong running right down to Deniliquin. I have seen the flood-water extend from a mile and a half on the north side of the Tuppal right across the Murray for about 8 miles, I suppose, on the Victorian side. That would be about 20 miles altogether. Flooded country.
3683. Were the floods regular? About forty-one years ago we had high floods on the Murray; we used always to look for a flood at the melting of the snow, and I have seen the floods high until December or January, so that you would have to go to Albury to cross unless you crossed in a bark canoe.
3684. But were the floods pretty regular? Yes, for four or five seasons, and then we had a few dry seasons. I think, if I remember rightly, that in 1844, 1845, and 1846 we had pretty high floods; they were very high in 1844 and 1845. Regularity of floods.
3685. And how long were the dry seasons? All the time I was down there we had twelve or eighteen months of a dry season at a time. Dry seasons.
3686. But did the seasons alternate regularly—two or three dry seasons and then two or three wet seasons? Two or three would be moderately dry, and then for two or three seasons we would have great floods, as far as my recollection serves me. Alternation of seasons.
3687. And over what period did your experience extend? I have known the Edward from 1840, I may say. I lived there most of my time from 1844 to 1855 or 1860, and during that time we had such seasons as I have mentioned. The driest season we had was in 1851.
3688. *Mr. Donkin.*] And in 1852 the big flood occurred? In the latter half of 1851 we had great floods. Black Thursday was on the 6th of February, 1851, and in the following May, June, and July we had heavy rains and great floods on the Murray. Flood of 1851.
3689. *President.*] Do you know anything about a hollow or valley that leads away from the Murray above Howlong? I have been on it in several parts, and I have been told by those who have followed it that it runs down to about Howlong near the Oil-tree—somewhere near to the Tuppal. A great deal of water lies about the Oil-tree. I went out to look at the Quat Quatta with James Day and Company, and we rode through water, at a distance of a mile or two from the banks of the river, all the way to the Oil-tree. Valley above Howlong.
3690. Do you think it would be practicable, by putting a weir across the Murray about Howlong, to divert a portion of the Murray water down to Jerilderie? I think it would, but it would be an expensive work locking the Murray. Weir across Murray.

3691.

Mr. J. M'Laurin. 31 Mar., 1885.

Wells.

3691. But apart from the expense of weiring the Murray, you do not think the expense of sending the water down would be great? If you once got the water high there would be no difficulty about its running down.

3692. Did you ever sink any wells down there? Yes, we had wells sunk for our own use—that was between the Tuppal and the Murray.

3693. Had you to sink deep, or did you get the water at a shallow depth? At one place I think we sank about 100 feet.

Quality.

3694. Was the water good? The water was pretty good at first, but I do not think it remained good; whether it was because we did not use it sufficiently or not I do not know. We sank a well at Curnalla for house purposes and only went about 20 feet down.

Water in creeks.

3695. *Mr. Donkin.*] Was there always water in the creeks? Not in the Tuppal, but there is always water in the Bullatella Creek.

Distribution about Howlong.

3696. *President.*] You think it would be possible, from the nature of the country, if you had a sufficient quantity of water at a higher level, about Howlong, to distribute it about that portion of the country? I fancy there is higher country out near the Billabong again, between this hollow and the Murray.

3697. *Mr. Donkin.*] But from your own knowledge you do not know that the water ever runs down that hollow? No, except it may be from local rains. I have been told that there was a run of water there in very rainy seasons.

3698. Could it be traced? I do not know, unless you had a run of water; then you could.

Weirs and dams

3699. *President.*] Do you know of any reason, in the nature of the soil on the Murray, why weirs or dams should not stand there? I do not know of any reason, unless it is from the immense pressure of water.

3700. But do you not think the soil would be likely to wash away? No; I think that about Howlong

Clay soil.

there is a good stiff clay soil.

3701. Have you been on the Darling? Yes, at Wentworth.

Banks of Darling.

3702. Do you think the banks of the Darling would stand weirs being put across? Well, when I was on the Darling, at the junction—I have never been above the junction—the soil seemed to me to be more porous than that at Howlong.

Weirs in the Darling.

3703. Is it soil that you think would stand if a weir were put across the river, or would it wash away in flood-time? It all depends on the volume and force of the stream. In all that country, if the surface is broken I think the soil will break away by the action of the water. In making dams on the Billabong, people found that if they broke the surface they ruined the dam—that was the reason why they sent the water so far out; if they made a by-wash on the Billabong they would ruin the dam, because if a flood came the whole thing would be washed away by the current.

3704. But suppose, on the same principle, that a dam with a sluice were placed across the Darling and the water allowed to get away by a channel higher up, do you think the dam would stand? From the nature of the country below the junction I should think the dam might stand, and there is this in favour of it, that

Current in the Darling.

the current is not rapid—there is not nearly the current in the Darling that there is in the Murray.

Depth at Howlong.

3705. *Mr. Donkin.*] What is the average depth of water at low tide at Howlong? I think I saw the Murray in its lowest state in 1851, and we had always 3 or 4 feet of water.

3706. You have never seen it a chain of ponds? No, nor do I think any other person has. In 1851 there was a good stream of water—you could just cross on horseback over the sand bank; but of course there was a considerable depth of water in some of the holes. I have never seen the Murray, the

The Goulburn and the Ovens.

Goulburn, or the Ovens, a chain of ponds, although I have seen them pretty low.

Natural basins.

3707. From the nature of the hills about the head of the Murray, do you think there are any natural places where water could be stored by means of not too expensive dams? Well, there are some fine basins on the Murray, but unless you went very high up to some of the branches near the head I think damming the Murray would be a very expensive work.

The Billabong.

3708. What height does the Billabong rise above the Murray from the head of the Yarra Yarra? I do

Fall.

not know; there is a great fall from the head of the Billabong down to the Murray.

3709. Can you give any idea what the fall is? I should say 500 or 600, or 1,000 feet.

3710. From the head of the Billabong? Yes, down to the Murray, because there is a sort of a table-land from the head of the Billabong, and then a great fall. I should say it must be 400 or 500 feet at the lowest, and perhaps more.

Diversion from the Murray.

3711. Do you think it is possible to divert the Murray waters from opposite the head of the Billabong into the Billabong in any way except by damming? I do not think so. You see, from the head of the Billabong to the Murray, I suppose, is about 10 or 12 miles, and it is a very rough, rocky, mountainous country.

3712. Do you think it is possible to go higher up near the junction of the river and get the water at an elevation there that would bring it into the Billabong? Well, my idea is this, that if you want a large supply of water, somewhere near Tumberumba would be the place. The hills are pretty high, but not so high as at the other place. There is a good deal of fall before you come to the hills. I should say that there is 600 or 800 feet of a rise, but never having measured it of course I cannot say exactly.

Natural basins.

3713. Do you think there are natural basins about the head of the Murray that could be utilized in conserving water? I do not know; I have never made an examination. There may be. You know the

Floods of the Murray.

Murray is a river which has, in flood-time, an immense body of water; and a strange thing is that you meet with more dry land near the river than you do some distance away.

3714. That is on the dry bank; there is always a wet bank as well as a dry bank—that is, the water spreads on one side for a mile or so? It is the case on both banks—wherever there is a bend.

3715. *President.*] Did you ever try any irrigation when you were on the Lower Murray? No.

Irrigation.

3716. Have you ever tried it anywhere in New South Wales? I have tried it a little at Yarra Yarra, about the homestead.

3717. And did you find the difference very great between irrigated land and non-irrigated land? The difference of course is that you have a spring all the summer with irrigated land, and if you have a good supply you can have grass or vegetables growing all the summer.

3718. Whereas there would be nothing if you had not the water? As an illustration of what may be done, I may mention that last year I had a general crop in my garden. I have a supply of water in a large dam a mile or so above the house, from which the water is brought in a pipe. The vegetables were just beginning to wither when I let the water on, but after that I had a splendid crop, although I do not think I should have had any at all if it had not been for the water.

Mr. J. M'Laurin. 31 Mar., 1885. Murrumbidgee River.

3719. It would be just the same with grass? Just the same with grass.
3720. You have not been out by Hay towards the Darling? No; I ran the Murrumbidgee down in 1839 from Gundagai to Adelaide.
3721. And have you known the Murrumbidgee ever since? Yes.
3722. Have you ever known it to stop running? No.
3723. Has there always been a good fair stream in dry seasons? Always, as far as I have seen. I have been on the Murrumbidgee, and on the Mutta Mutta, the Murray, and the Ovens. I was on the Murray, the Ovens, and the Mutta Mutta in 1851, and they were always running. That was the driest season I have seen in the Colony, and they were all running a good stream then.
3724. *Mr. Donkin.*] Were there many losses in stock when you were on the Murray? A great many in 1851. Losses in stock.
3725. For want of grass? Yes, and water, because there was no water on the Billabong. The people there had to take their stock to Deniliquin and travel up the river wherever they could get grass. Want of grass and water.
3726. *President.*] You say that an immense body of water passes down the Murray in flood-time: has any plan ever struck you by which that water could be conserved or diverted—you say you do not think it could be done well at the head of the Murray? No, I think Howlong is the place to do it. I think the ground would stand better there, and there is not the fall or the mountain torrent you find further up. At Howlong you have a very high bank on the north side, and a splendid basin from there up to Wodonga. My opinion is that it is quite possible to take the water from Howlong, not only into the Billabong Creek, but north of it. Conservation of Murray flood-waters.
3727. Then you do not think it a feasible scheme to take the water from above Albury and bring it to the Billabong? It would be more expensive, because you would have a tier of high mountains all the way, and if you carried the water in pipes, you would either have to cross the immense gorges, or go right around. Besides we always get plenty of water at Yarra Yarra. I think that if people were not too indolent, they would have no difficulty in saving water. Diversion into the Billabong.
3728. It is not so much for that purpose, as to bring the water into the Billabong Creek? I think there would be great difficulty in bringing the water from the head of the Murray.
3729. Do you know where there is any large basin at the head of the Murray, or any creek where the banks come together in such a way that a dam could be thrown across? I do not know anything about that part. Site for dam.
3730. Do you think it is worth while to inspect that part of the country to see if there are such basins? Well, the head of the Billabong goes into a number of creeks, and although there are basins there, most of them have not a great run of water.
3731. *Mr. M'Mordie.*] At any time of the year? At any time of the year. Of course to fill a large space you require a good watershed.
3732. *President.*] Whereabouts is the spot you think most suitable for diverting the Murray water? Near what they call the Holy Plains, near the upper boundary of the Quot Quot Run. In flood-times the water comes some distance from the river, as far as there are any gum-trees. That is most decidedly the easiest place. You will find a hollow running out from there to the Oil-tree. Diversion point on the Murray.
3733. Have you had any experience of tank-sinking on the Lower Murray? No, none whatever; we had plenty of well water, and had no occasion to sink tanks. Tanks.
3734. *Mr. M'Mordie.*] How often have you known the Billabong Creek to flow into the Edward—does it flow often? Always in flood-time, if it is not dammed; but it has not run below Walla Walla for many years. During 1838, 1839, 1840, and 1841 it did not run. That is at Culcairn, where the railway crosses to Albury. Flow in the Billabong. Bed of Billabong.
3735. *President.*] The Billabong Creek is a large deep creek, well defined, with high banks, that would carry a large quantity of water? Yes; but these last few years there has been very little water—I mean down the creek.
3736. I think you are of opinion that all the country along the north of the Murray up to the ridge above Tuppal Creek could be watered? Yes; and there would be little difficulty in taking the water to the north of the Billabong from the Murray, from about Quot Quot, just below Howlong, at what they call the Holy Plain. It would be a very inexpensive work to let the water into Tuppal Creek at the time of a small rise. It runs in now when the river rises, but if the channel at Moom were deepened more it would let the water in much sooner. Watering of country north of the Murray.
3737. *Mr. Donkin.*] Do you think the scheme is more feasible about Howlong than above Albury? Yes, and less expensive, and it would water the country more effectually. Besides, you have the waters of the Little River and of Mutta Mutta, which are always running. Little River.
3738. It would not benefit you much to bring the water in the way you recommend? No, because I have plenty of water. By making a large embankment on the Victorian side and raising the water you would have an immense supply. About the head of the Murray I cannot give you any opinion.
3739. What is the distance from Howlong to Jerilderie? From 80 to 90 miles, I should think. When I travelled down to Adelaide in 1840 no white man had been from the outlet of the Edward to the junction of the Murrumbidgee—there was not a track of anything. Distance from Howlong to Jerilderie.

SATURDAY, 9 *MAY*, 1885.

At Tamworth.

Present:—

MR. FRANKLIN, C.E., MR. LYNE, M.P., | MR. MURRAY, M.P., MR. M'MORDIE, B.E., C.E.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. Arthur Dewhurst called in and examined:—

Mr. A. Dewhurst. 9 May, 1885.

3740. *President.*] You are a district surveyor? Yes.
3741. Have you resided in this district for any length of time? Since 1858.
3742. Have you had opportunities of becoming well acquainted with the whole district? I have.
3743. Are you well acquainted with the heads of the various rivers above Tamworth—the Cockburn, the Peel, the Dungowan, the Swamp Creek? I have been to their heads, or in the neighbourhood of their heads.

Mr. A. Dewhurst. 9 May, 1885.

3744. Have you any idea of the watershed of these creeks and rivers, that is to say, the area of it? I could not tell you here—I should have to calculate it; I dare say I could give it you near enough for your purpose.

3745. We want to know the watershed of the whole of the water flowing past Tamworth? I understand.

Watershed. 3746. The whole of the water coming by Tamworth comes from the creeks I have named, does it not? Yes. I could give you the watershed of each particular creek; but I may say here that I am not prepared to deal with the question of water supply at all—the Government have given me no time for anything of this sort.

Storage reservoirs. 3747. Do you know anything of these creeks or rivers having any natural basins where large quantities of water could be stored? I never looked for any, but I was shown one the other day by Mr. Stuart; I have no doubt that there are plenty as good as that.

Seven-mile Creek. 3748. What is the site of that basin? The Seven-mile Creek.

3749. What distance from Tamworth? 7 miles. That is the nearest route approximately by which you could convey water.

Storage capacity. 3750. Could a large quantity of water be stored there? Very large indeed.

Expense. 3751. Does it appear to you that the works necessary for the storage of that water would be very expensive? Not very expensive, I think.

Land. 3752. Is the land purchased land? The land is the property of the Crown.

3753. Is it a reserve? It is within the population boundary of Tamworth, and therefore reserved from sale.

3754. Is most of the land in the valleys to the south-east of Tamworth alienated? Only on some of the creeks.

3755. Is the land not alienated reserved, or is it not alienated because it is of no value? Because it is of no value comparatively.

Resumption of land. 3756. Supposing any number of schemes were entered into with these creeks, would there be large quantities of land to be resumed or bought—I refer now to land which would be covered by water in the event of storage grounds being selected at particular points? Of course that is very difficult to say, unless one knows what the nature of the works would be; it is a question of levels. If you were to stop the Cockburn River you would have a very fair amount to pay—some thousands of pounds.

Swamp Creek. 3757. Would there be much land to resume in connection with a work at Swamp Creek? Nothing on that I believe; I think that is about the only creek upon which there would be little or no resumption. Of course if the work were carried out by means of a series of weirs it would flood less country.

Resumption of land. 3758. Supposing these rivers or creeks were dammed and a quantity of water were thrown back over the flats, would that necessitate the resumption of a large area of land? I have already said that that would be the case along the Cockburn in places, also along the Peel and Dungowan.

Advantages from storage. 3759. Is it practicable to store quantities of water which would be of service not only in the neighbourhood of Tamworth, but also further down towards the lower country? I do not think it would be of any great advantage.

3760. What is your reason for thinking so? This is ground upon which I would rather not enter; I have not thoroughly considered the matter. If you were to report what I say now, it might clash with the opinion which I shall have the pleasure of giving you by and by. I wish to consider the matter thoroughly. I have been asked by the Commission—at least I have a circular to that effect—and I prefer that my evidence upon the line you are now taking should be confined to my report in answer to that circular.

3761. Then I am to understand that you have not sufficiently thought the matter out at the present time to permit your giving evidence to the Commission? That is exactly what I wish you to understand.

3762. But you will do so in reply to the circular which the Commission have forwarded? If the Government will allow me time to do it.

Heads of rivers. 3763. Are you well acquainted with the heads of rivers in any other part of the district? I think I know them all; I have been here twenty-seven years.

Walgett. 3764. The country in the neighbourhood of Walgett is entirely different from that in the neighbourhood of Tamworth? Yes, it is.

3765. Flat? Quite flat.

3766. And badly watered? Yes.

Dry creeks. 3767. Are there many dry creeks or ana-branches running through it? A great many, more or less, in the vicinity of the river.

Floods. 3768. These are filled only in flood-time? Yes, the whole is covered in flood-time. I could mark you out the area on the map.

3769. The water runs over the surface, then goes to waste? Yes, we should say it goes to waste; it is not utilized.

Storage on Namoi. 3770. Do you consider that a great deal of water which flows down the Namoi, coming from the mountain ranges, could be impounded and prevented from going to waste? A great deal of it.

Natural basins. 3771. Through the rangy part of your district are there natural basins for the formation of reservoirs and lakes? I am not intimately acquainted with them, but I feel sure that there are.

3772. You could not direct attention to any particular spot in connection with which further investigation could be made to ascertain whether a natural basin does or does not exist? I could not at present.

Underground stream. 3773. Has it ever come within your knowledge that there is any underground stream or spring in your district? Yes.

3774. Could you point out in what part? In the neighbourhood of Millie, in the county of Jamieson, near Narrabri.

3775. Is it an underground stream? Yes.

Depth. 3776. At what depth? I have it not with me at present, but, speaking from memory, I should say from 20 to 30 feet.

Width. 3777. Have you any idea of the width of the stream? I should say, at the very least, 10 miles.

3778. Is the water obtained in drift? It is not a drift; I can hardly tell you what it is; it runs to the westward.

3779. Are there any indications on the surface? None whatever.

3780. How is it tapped? By a well.

3781. By one or more? A great many wells.

Flow. 3782. Has it been tested at any distance from the Barwon? It is running—there is a perfect flow in it.

3783. Artesian? Not artesian.

Rise. 3784. Have you any idea where it rises or comes from? I have not at present. I could find out easily enough by looking at the map; that is to say, I could find out where it does not rise from, and from that I could tell you where it did.

Mr. A. Dewhurst.
9 May, 1885.

3785. Is the water good? It is salt water.
3786. Cannot it be used? Not for domestic purposes.
3787. Is it fit for stock? I doubt it; I am not sure; I have all the particulars, but I do not like to give you these things from memory.
3788. I understood you to say that the stream is pierced by a number of wells—are they using these wells for any purpose at all? They sank deeper, I believe, into fresh water; they got through, but I believe that they had the greatest difficulty and trouble in doing so. Wells. Fresh water.
3789. Have you any idea of the depth to the fresh water? I think that it is about 110 feet. Depth.
3790. Did they get a good supply at that depth? Not sufficient, I think. Supply.
3791. Did they get it at that depth in all parts of the district? I am not sure; my impression is that that is the depth at Boggy Creek; there is a Government tank there. Boggy Creek.
3792. In sinking these wells, did they line them to keep the water out? I forget the way in which the men got through the drift; I think that they slabbed and puddled it, if I remember aright; but I know that they had a great deal of trouble.
3793. There is no doubt, I suppose, that this salt water, or rather the water which becomes salt, comes from the surface higher up somewhere? Yes. Source of salt water.
3794. Do you think that it would be possible to intercept it at a point where it sinks in through the upper strata? I do not know: I should like to know a little more about it before I ventured to offer an opinion on that point; if I knew the section of its bed it would be very easy to settle it. Interception.
3795. Where is Moree? Not far from that point. Moree.
3796. What is the nature of the soil? Black. Soil.
3797. Up to the heads of the rivers? Nearly to the heads; here and there there are sandy ridges. Rivers.
3798. At the heads of these creeks—the Wee Waa and several others, the Big River and its tributaries, is it rangy in the same manner as near Tamworth? There is the great Nandewar range. Nandewar range.
3799. In that range would the same facilities be found for the storage of water? There are plenty of basins. Basins.
3800. Have you any information respecting wells in that part of the district? I know a great deal about them. Wells.
3801. Is there a well at Boolcarol? There are several wells there. At Boolcarol.
3802. Have they sunk them to any great depth? About 60 feet, I think. Depth.
3803. Did they get a good supply? In some cases. Supply.
3804. Is it salt or fresh water? In some cases it is pretty fresh. Quality.
3805. Serviceable for stock? Yes.
3806. Is that distinct from the other line of country which we have been speaking of? Yes.
3807. In the Boolcarol wells is there a flow in any direction? I could not say; it is not artesian water. Flow.
3808. Do you think that throughout the low country in the county of Jamieson, and in the Gwydir district, any good could be done by storing water at the heads of the creeks and distributing it throughout the flat country for stock purposes? It might be useful to the people who own the land. Storage in Gwydir district.
3809. Is the land in most cases good enough for agricultural purposes? It is good enough for anything. Land.
3810. And the only drawback is the want of rainfall? It is the climate—the want of moisture in the climate. Want of moisture.
3811. Do you know anything of the swamp to the north of Mille? That is out of my district.
3812. Do you know the country south of the Namoi? Yes. Namoi country.
3813. Do you think that artesian water is likely to be found there? I know that it is. Artesian water.
3814. In many places? I know of several places. Locality.
3815. Can you indicate any spot? There is the Bando, for instance.
3816. Does the water rise to any height above the surface? It runs over the top of the well, but the supply has slackened. Supply.
3817. What is the size of the well? I forget; it is a large well. Well.
3818. An open slab well? An open well.
3819. Do you know the depth of it? I think that it is about 70 feet; it is referred to in a report by Mr. T. K. Abbott, on wells in the Liverpool Plains. Depth.
3820. Is that the only case of artesian water? No; the water comes into that well from the sandy catchment, where there is no evaporation, at Coonabarabran; that is to say, from the counties of Baradine and White; there is a sandy formation there covering a very large area. Source.
3821. What is the area? Immense; over 1,000,000 acres. Area of sand ridges.
3822. Is it high land? Part of it is high, and part low; there are ridges running through it; it is higher than where the well is sunk; it is the great storage of water for Liverpool Plains.
3823. Do the Brigalow and Borah Creeks run through ridgy country? Comparatively flat country. Brigalow and Borah Creeks.
3824. Are they high enough in the neighbourhood of Coonabarabran to permit of the formation of basins? The difference of the level between the springs at Girrawila and the well at Bando will give you an idea. I should say that it is about 400 feet.
3825. Which way is that artesian water flowing? It flows with the creeks, trending generally north and west. Flow of artesian water.
3826. Are you acquainted with other wells? There are several wells similar to those to be found on the Caspian Sea and in parts of America. Wells.
3827. Are they artesian? I should imagine so; their depth is very great; I could not find the depth at 40 feet; they are full of water to the consistency of thick cream. Artesian.
3828. Referring again to the watershed above Tamworth, is there any extent of country in the neighbourhood of Tamworth which could be irrigated if water were stored at the heads of the creeks? All the Cockburn River farms could be irrigated to some extent. Irrigation.
3829. Have you any idea of the difference in value as between irrigated and non-irrigated land? I have. Value of land.
3830. What would you consider the difference? That would depend on the land irrigated and a good many other things besides.
3831. I am speaking of the class of land in this valley? The best alluvial flats I should think would go to three times their value, at the very lowest estimate.
3832. *Mr. Franklin.*] Have any observations been taken of the average flow of water through Tamworth? No register is kept now.
3833. What is the catchment area of the Cockburn above cultivation? I could not say. Area of the Cockburn.
3834. Is it very large? Very large.

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3835. If a large body of water were stored above the present line of cultivation and regulated down into the river or courses along the valley, would there be much storage on the present holdings of cultivable land? There would be a great deal of disturbance of course if the water were led through any of the holdings.

Fall of country. 3836. Then by running the water in a true course it is possible that we should come above the surface quickly, although we dam the upper part of the river itself? I do not think that the fall from Moonbie to Tamworth is very great.

3837. Do you not know the fall? The railway levels would give it to you.

Hanging Rock. 3838. There is a large watershed at Hanging Rock? Yes.

Discharge. 3839. Could a discharge of that river be made at any point above Bowling Alley Point without disturbing cultivable areas of land? I do not think that you could get enough water above Bowling Alley Point.

3840. Do you know any point at which it would not disturb present improvements, and where water could be thrown back with a view to keep your river constantly running? I do not.

Neringa Flat. 3841. What is the area of Neringa Flat under cultivation? I could not say.

Population 3842. There is a large population there, is there not? Comparatively small.

3843. They depend greatly, do they not, on the water flowing through the river for all purposes? They have wells.

Cultivation land. 3844. Supposing they could get water by gravitation, there would not be much more land under cultivation? I do not think that any more land would be put under cultivation. I say all this with reserve.

Dam at Seven-mile Creek. 3845. You mentioned a site which you saw in company with Mr. Stuart which is capable of holding a large body of water at Seven-mile Creek—have you any idea of the size of the opening which it would be necessary to dam in order to impound the water? That would depend entirely on where the dam was made.

Opening. 3846. You did not form any idea at the time of your visit? A dam at the point at which I was looking would be very large indeed.

Height. 3847. Would it be a high dam? You could make it as high as you liked to impound more water.

3848. There is no natural depression in the land which would give a basin of which the lowest lip outlet could be taken for dam purposes? I do not think so.

Range between Tamworth and Manilla. 3849. Could a large quantity of water be held back between this and Manilla—What would be the drainage line—would it be the flats of the Namoi, or is there intermediate country? The question is where you would impound. There is a dividing range between Tamworth and Manilla.

3850. Are there any gaps? Yes; the Peel River makes a gap.

3851. Supposing we reduced the fall of the Peel River by a canal, could we get through the range to discharge water on the other slope? No.

Water in sandy area. 3852. With reference to the large sandy area to which you have referred, do they find water in the sand itself? The creeks are dry except in deep water-holes, but you can scratch and find water anywhere almost.

Moree. 3853. *Mr. Murray.*] Do you know anything about Moree? I was never there.

The Meei. 3854. Do you know anything about the Meei, an ana-branch of the Gwydir? I have been there—that is all I can say.

3855. Do you think on the whole that any system of conservation could be adopted in the district which would be beneficial to it for stock and for irrigation purposes? That is a question which I cannot answer at present.

Losses through want of grass. 3856. Do you think that if the people were benefited to a considerable extent, they would be agreeable to subscribe towards the expense, by allowing a rate to be levied upon them commensurate with the extent of the improvement? I do not think so. I may mention casually that in this district losses have been occasioned by want of grass, and not by want of water.

Irrigation of the plains. 3857. If we had irrigation should we not get grass? I do not think that the plains will ever be irrigated; there is not sufficient water to irrigate them.

3858. Suppose that the flood-water of which you have been speaking which goes to waste were stored, would that not be sufficient? I do not think so.

3859. Then you do not think that the labours of the Commission would be of great benefit to this part of the country? I think that they will be of benefit if they only prove that the attempt to irrigate the plains would not be successful.

3860. You think that that is what it will result in? I think that you will not irrigate the plains.

3861. Would irrigation improve agriculture? I think so.

Soakage. 3862. Is there much soakage in the creeks and rivers? In many of them, such as the Cockburn.

Silting. 3863. A good deal of silting takes place with over-shot dams? In some rivers where there is a fall.

Sluice-gates. 3864. With sluice-gates to wash out the silt, there might be reservoirs made suitable for irrigation for agricultural purposes? I think so.

Irrigation. 3865. *President.*] If the upper parts of the valleys were irrigated as we have suggested, do you think that any large increase of the hay and straw produced by irrigation would assist in keeping the stock in the lower parts alive in the dry seasons? It would do something towards it. My opinion on that point may be carried further; irrigation could be carried out on every station to a certain extent—I have seen it done effectually.

3866. In the vicinity of rivers? Yes.

Population. 3867. Is there a large population from this point downwards towards the plains before you actually get on to them? There are no plains between here and Walgett till you get back from the river Namoi.

3868. In the valleys of the rivers is there a large agricultural population? The country from here to Gunnedah is well populated.

Benefits from irrigation. 3869. Do you consider that that population would be much benefited by the conservation and distribution of water which would be used for irrigation? I do.

Local Trusts. 3870. Do you consider that the conservation and distribution of water should be carried out by the Government or by local bodies created for that purpose, the Government lending the money? I think it should be done by local bodies if done at all.

Flood-waters. 3871. *Mr. M'Mordie.*] Have you any information as to the quantities of flood-waters which pass down these various rivers at the present time and which are not utilized? No.

Irrigation. 3872. Could you say what quantity of irrigation could be carried out by means of these flood-waters if they were stored? Yes, I could to a certain extent.

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3873. At what quantity would you estimate the water for that purpose? I could not go into a calculation of that sort at present. I should have to go through my list of the average rainfalls for the last twenty-seven years.
3874. You have no information as to the quantities of flood-water passing down which would enable you to state what quantity of irrigation could be carried out? No.
3875. What area in the neighbourhood of Gunnedah is occupied by coal-beds? It extends from Gunnedah to Mille, where it squeezes out. Coal beds.
3876. *Mr. Murray.*] It is about 6 feet at Gunnedah? In places.
3877. Through the whole of that country can you obtain water by sinking? I think everywhere. Water in coal beds.
3878. Good water? All good water.
3879. *Mr. Franklin.*] Do you know the Macquarie and the Bogan? Yes.
3880. Do you know the large swamp there? I have not been to the Macquarie swamps.

Mr. Alexander Rogers examined:—

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3881. *President.*] Where is your residence? At Attunga.
3882. How long have you resided there? Ten years. I have resided forty years in the northern district, but more east.
3883. Have you property at Attunga? Yes.
3884. Have you any other property in the district? I have a station in the Gwydir District, and another in the New England District, but that is on the eastern slope and is well watered.
3885. What is the nature of the country at Attunga? Dry limestone. Attunga.
3886. Is is ridgy? Yes.
3887. Are there natural basins in these creeks for the storage of water? Very good places for making dams—you could dam large quantities at places. You can find watersheds where the creeks have broken through the bars. Basins.
3888. Could any large quantity of water be stored there? You could store millions of gallons on the Attunga Creek. Storage on Attunga Creek.
3889. Do you know the Peel River? Yes, I know its heads. Peel River.
3890. Is it ridgy country? Yes.
3891. Are there large basins there which could be utilized for the storage of water? Yes, I think so. It would be more expensive there—the soil is of a looser character. Storage.
3892. Is the soil lying back from the Peel River towards Gunnedah rich? Yes. Soil.
3893. Are the floods of any width? Not very wide. Floods.
3894. Are the floods small below the junction of the Namoi and the Peel River? They are larger there.
3895. Are there any farmers? I think not.
3896. Do you know the country lower down between Gunnedah and Narrabri? Yes.
3897. Do you think water could be conveyed in that direction by keeping it at an elevation above the river? I think so; it is a matter of expense; all the farming land could be watered. Farming land.
3898. Do you think that any good would be derived in saving stock by taking water through the back country there? I think that if the supply could be regulated so that the frontage of each run could be irrigated, the losses of stock would be very small. Back country.
3899. You talk of water being taken from the frontage of the runs—do you mean along the river frontage of the runs or along the frontage of the back rivers? I mean such rivers as the Meei, which run themselves right out. The Meei.
3900. What becomes of the water? It runs clean away; some goes into the lower strata, but it runs into the Darling. I am afraid the difficulty would be so great that the cost would exceed the value. If you could conserve water at the head of the Peel River you could take it out on to the large plains, where you could get as much grass on 100 acres as you could get on 1,000 acres elsewhere, provided the water were diverted by a canal from the river on to the back plains. Difficulty of water conservation. Benefits.
3901. Could the station-holders irrigate their lands and at the same time grow hay for their stock? I think so; it would be a matter of industry. Irrigation.
3902. The climate is not of such a nature that it would prevent them from growing these crops? No. Climate.
3903. Supposing this were done, would it induce a farming population to settle on the lands which are not alienated? Yes, there is any amount of farming land between here and Gunnedah, and between Gunnedah and Narrabri, and across to Moree, but it requires moisture. Farming population.
3904. Supposing any scheme of that kind were carried out, should it be done by local Trusts? I do not see how it could be carried out by means of the public purse, on account of such a large quantity of land being purchased; I think it must be a municipal arrangement. In order to irrigate, you would be obliged to pass through private land. Local Trusts.
3905. Supposing irrigation were started from the head of the Peel River and the Namoi, and water were conveyed a great distance down towards Walgett and Brewarrina, the better plan I suppose would be to have a series of Trusts along the river? I think so. Series of Trusts.
3906. The area would be too large to be undertaken by one Trust? Yes, it would be far too large.
3907. Can you give us information as to the porous nature of the land in the centre of your station and on the Peel River? It is not porous in my neighbourhood—it is limestone country. It is not so porous as it is further down the plains. A very small amount of rainfall will grow a crop of wheat near my place. Nature of land.
3908. What is the rainfall? I could not say; it is very small indeed—about the same as at Tamworth, perhaps a little less. Rainfall.
3909. Have you any knowledge of underground streams of water? No scientific knowledge. Underground streams.
3910. But practically? I know that on the flat country down the Meei, and the watercourses across to the Barwon, and on the northern part of the Gwydir, wells have been sunk, and I do not know of any failure to get water at 30 feet in the sandy ridges. It has also been obtained at depths of 60, 80, and 130 feet.
3911. Where does it come from? It strikes me that there is an underground deposit of water. I would not say that there is a current; there is an underground supply lying dormant.
3912. Where does it come from? When the river overflows its banks the whole country is flooded for a distance of 50 miles. I have seen water running into a crack for a quarter of an hour. It runs away into the bowels of the earth and remains there, forming the source of supply which I have mentioned. Flooded country.
3913. Do you find that it will give out at all? Sometimes at 30 feet, or even at 60 feet, the supply seems to fail, but when you sink further the water is recovered. Supply.

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3914. Then there is more than one stratum of water, so to speak? I think the water falls away. We have not had a flood in that country since 1879, and the water has been gradually exhausting itself. It is a question of following it down. I have seen water recovered in one of those instances at 3 feet without going through any strata.

Salt water. 3915. Mr. Dewhurst spoke of a stream of salt water flowing towards the Darling? That is further south. I have been speaking of the country north of the Meei. I know that people have wells, as Mr. Dewhurst described them, but that is all I know about them.

Character of soil. 3916. Are there any open or permeable strata along the side of the range which allow the water to sink into lower strata and run down towards the Darling? No, I think not. The character of the soil at the heads of these rivers is of such a nature that the water runs off it; it is all clay; the rock is near the surface.

3917. Does the water follow that rock down into the low country to a point where you lose it? I think not to any great extent.

Big Leather Swamp. 3918. Do you know the swamp shown on the map in the Benarba and Courallie Counties? Yes, it is known as the "Big Leather Swamp."

3919. What is the cause of that swamp? It is an old river-bed—it has been the channel of a big river; it spreads out from 3 to 5 miles. The river is an immense reed-bed now; it is quite dry, but in flood-time it is up to the saddle-flaps in water, and it is about 4 miles across.

3920. What is the nature of the country on the edges? Hard ridges and clay plains, not more than 10 feet in height, with about 4 feet of water, and of course an additional 18 inches would flood the country for 30 miles.

Chasms. 3921. And that water cannot be stored? No. Millions of gallons flow into the chasms I have spoken of, and when the ground is saturated and will contain no more the water flows into the Gwydir.

3922. Is the upper part of the swamp hard land? About Moree it is pretty hard.

Diversion of water. 3923. The water will not sink in there? No. Between Pallamellowa and Moree you might find places at which the water could be diverted and prevented from going into the swamp and becoming lost.

Settlement. 3924. Is there much settlement about the banks of the Gwydir? Not much.

Soil. 3925. It is all good soil? Yes.

3926. It only wants water to make it productive? Yes.

The ranges. 3927. How far have we to go to get the ranges? You do not get into the ranges until you reach Bingera.

Site for reservoir. 3928. Is there any population between Pallamellowa and Bingera? Only a few selectors. There is a good site at Pallamellowa for forming a large reserve.

3929. By damming the river could you conserve a large quantity? Yes, about 5 miles above Pallamellowa.

Width. 3930. What width would you get? Above Pallamellowa you would get high bank and slanting ridges. You could store millions of gallons of water. The total width I should say would be about 1 mile.

Breadth of gap. 3931. How broad would be the gap that you would have to dam? In some places it would be a quarter of a mile wide at the top of the bank.

Current. 3932. Is the stream rapid or sluggish? It is not like a mountain torrent.

3933. And the dam would throw the water back a considerable distance? Yes.

Value of land. 3934. What is the value of the frontage lands on the flats? It is only valuable as pastoral land. If irrigated it would be equal to land in the Clarence district, worth from £30 to £40 per acre—now it is worth only about £2 per acre—that would be its highest value.

Water rates. 3935. Do you think that the people who would be benefited by irrigation and by the distribution of water for stock purposes would be prepared to pay rates? I could not say; I am very doubtful; as far as I know, stock-owners would pay rates, but I doubt whether small holders on the frontages would take to it kindly. I suppose they would in time, when they knew how greatly they were benefited.

People's opinion. 3936. From your practical experience and knowledge, then, you think that the people of the country generally are not sufficiently alive to the great good which water conservation and irrigation would do to them? From conversing with them I think that they are of opinion that it would be a good thing; that is, they are sensible of the advantages of irrigation, still none of them are very enthusiastic about doing anything in the matter.

New England district. 3937. You have a station in the New England district—is that on high land? Yes.

3938. All through that country the storage of water would not be of so much value in the neighbourhood as for distribution on the plains, I suppose—would it be of any service to divert the eastern waters on to the western slopes? It would be too expensive; the streams which you have would, I think, be too small.

Moore Creek. 3939. *Mr. Franklin.*] You were speaking of Attunga Creek—could that creek be connected with Moore Creek at the head so as to increase the volume? I think not; it is surrounded by a high watershed.

3940. The Attunga Creek is not very large? There would not be any object in conserving water there, except to convey it a long way off.

3941. *Mr. Murray.*] You know the neighbourhood of Moree? Yes.

The Meei. 3942. Do you know the Meei? Yes.

3943. Are you aware that it has been dry there for a long time? Yes; unfortunately I have a station on it.

3944. What is the cause of that? The Meei is simply a gutter, and therefore holds no great quantity of water; it drains off and exhausts itself.

Exhaustion of Gwydir. 3945. Is it not being fed now by the Gwydir? The Gwydir exhausts itself above Moree; a great quantity of water is carried away in times of flood; about 19-20ths of the water which comes down is lost. The Big River is lost in the watercourses, and there is nothing left but a small stream in the Meei, which lasts about six or nine months.

Meei cutting. 3946. The Meei, I understand then, is seldom fed by the Gwydir except at high flood? Yes.

3947. Would it be an advantage to open up the mouth of the Meei and let in the water at the same level as formerly? It would be doubtful; I think that you would drain the Big River. The Meei gets another supply from back creeks independently of the Big River.

Mother-of-ducks Swamp. 3948. You know the Mother-of-Ducks Swamp? Yes.

3949. Would it be of any advantage to expend money in deepening and preserving it as a large reservoir for water? That is hardly a fair question to ask. According to my idea, I do not think it would be a national advantage.

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3950. If it were done you do not think that the water could be utilized? Except locally. It is in a moist climate, and there is no necessity for it.

3951. Could you apply it to irrigation? I think that the rainfall is sufficient for all purposes.

3952. Is it good agricultural land? When you get a piece of land which is not stony it is very good.

3953. If the water were to be used for irrigation, it would require to be pumped from the swamp to a higher level? Yes.

Pumping on the Gwydir.

3954. *Mr. M'Mordie.*] Do you know of any irrigation in the Gwydir district by pumping? I know of one pumping machine, that of Mr. M'Donald's.

Purpose.

3955. What is the water used for? To water a lot of dry country which in its natural state is waterless.

3956. What distance do they convey the water? They water the country about the Midkin run, a lot of country which could not be stocked with sheep until they got the water to come through.

Distance.

3957. Can you state roughly the distance which they convey the water? Judging from information which I have, I should say 20 or 30 miles.

3958. Is that pumping still carried on? It was being carried on a few months ago; they pump into several creeks, and cut from one to the other.

Success.

3959. Does it pay? It is a success, but I do not know that it pays financially; I know that they are able to run a lot of sheep. Mr. Perry is the manager, and he would be able to give you information on that point. Of course, in the absence of the water, they would be unable to utilize the country. The supply runs through two stations which have joined in the work.

Queensland country.

3960. *President.*] Where is your other station? Near Wecrona, in Queensland.

3961. What is the nature of the country? It is black soil and scrubby.

The Macintyre.

3962. What sort of a river is the Macintyre at that point? Deep, but not very wide.

3963. Is there a constant stream? It scarcely ever ceases to flow.

Water conservation.

3964. Are you below the mountains? Yes, it is all flat country; before you could conserve any quantity of water you must go to the hills above Boggabilla.

Supply from Big River.

3965. Does sufficient water come down the Big River watershed to water the whole of the country in the counties of Benarba and Stapylton? The water could be distributed throughout the whole of that country.

Wells.

3966. Have they wells there? Almost on every station.

Depth.

3967. At what depth? From 60 to 80 feet; at various depths.

Supply.

3968. Is there enough water for use and for stock? Yes.

3969. Where does it come from? I do not know. I know that there is a deposit of water there.

Waterholes.

3970. Have you any wells in Queensland? There is no need for them at my place; there are two creeks out back from the river on my station, and waterholes large enough to sail a boat in—much larger and more permanent than those in New South Wales.

Drought.

3971. *Mr. Murray.*] Has much stock been lost in consequence of the drought in this district during the last seven years? An immense quantity.

Loss of stock.

3972. Can you give any idea of the value of the stock lost in the Gwydir district? Fully one-half of the horned cattle in the Gwydir district must have died within the last four years, and a very large number of sheep.

3973. Can you roughly estimate the value of the stock? No.

Reduction of loss by water conservation.

3974. Could a system of water conservation be devised to save a great quantity of that stock? I am quite certain of it; I am sure it would reduce the deaths to a very small percentage annually; I am sure there is enough water running down in the watershed of the Gwydir to last from one flood to another, could you only keep it.

Water rate.

3975. Speaking as a stockowner yourself, would you be willing to pay some share towards the expense of these works? Yes, certainly I should, so much so that I have consulted my neighbours with reference to a scheme.

Positions of storage reservoirs.

3976. *President.*] You think that it would be better to obtain water by storing it higher up and gravitating it over the country than by pumping it? Yes, I think so, decidedly.

Artificial feed.

3977. *Mr. Franklin.*] If a quantity of water could be thrown over the agricultural portions of the pastoral holdings, do you think that you could grow sufficient feed to keep your stock alive in the worst seasons? I think we could grow enough to save them from dying; I think that each runowner would provide enough from year to year to save his stock from dying. It is a question of industry.

3978. It is not the practice now to grow large quantities of fodder? No, it is not.

Lucerne paddock.

3979. Hitherto you have been depending on the natural grasses in a large measure? I have a lucerne paddock, in which I grew a large quantity of lucerne; two years ago I fed about 150 head of valuable stock, which would have died in the droughts, from a small lucerne paddock, containing between 20 and 30 acres.

Carrying capacity of runs.

3980. Suppose you had a canal, from which you could gravitate a supply of water through open channels to various holdings, would you be able to grow fodder to any large extent to feed stock? Most unquestionably; the carrying capacity of the runs would be made very much larger.

Low sand-ridges.

3981. *President.*] Have you any other information which you think would be of value to the Commission? I should like to say that north of and along the edge of the Big Leather watercourse there is a chain of low sand-ridges, commencing at or near the Gin Waterhole, where the road from Meroe (on the Mehi) to Benarla (on the Gil Gil) crosses the Big Leather watercourse. West of this road and north of Big Leather those sand-hills commence and run in a line at intervals of a mile and a half, sometimes 2 miles apart, from east to west, on the northern edge of the Big Leather, a distance of 7 miles. Water is found on each of those sand-ridges, at various depths of from 14 to 40 feet, in very large supply in some cases, in others a medium supply, and some less. In no case are those ridges or patches more than (I think) 24 inches higher than the level of the surrounding land; the centre of some of the best are depressed in the centre, being a lagoon when the country is flooded. The first of those ridges I allude to was selected about 1882 by a man named Miller, being 80 acres; he opened a well; at 20 feet got water; he having no stock, a neighbour who had no water in 1883 rented the well, made it larger, and for six months watered about 600 head of horses and cattle daily without exhausting or lowering the supply; the stock, at the end of the time mentioned, were taken off to their run. In 1883–84 travellers could not get on for the want of grass; a great number of people went to the watercourse with their cattle and horses, chiefly working stock. There were selectors and others also at this place of refuge. At the time my story commences there was grass, such as I described in my evidence to-day, for several miles around, so that a large number of stock could get food. Five wells were sunk and slabbed on Miller's 80 acres, water being drawn daily from

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from each well at the same hours, to water, perhaps, 2,000 head of large stock. This continued until the drought partially broke up, in July, 1884, after which the stock went to their respective homes. The water is lying now useless in its buried bed. Macdonald, selector, and Mackenzie, selector, are lower down, or west, all on the north boundary of my Meroe run, so that I know what I am informing you about. Then we get west to Bucknell's Crinoline Wells, which it is said would water 60,000 sheep. This is, I think, the most western, and is about 7 miles, or perhaps 9 miles, west of Miller's five wells. Those are a few of the names and the most important ones, but there are others betwixt, men of smaller means, who have not developed the water supply—indeed none is fully developed. I do not know that this will assist you in your great inquiry, the most important which has or perhaps ever will be entrusted to a Commission.

Bucknell's Crinoline Wells.

Water conservation on Liverpool Plains.

I should also like to say a few words with reference to the question of conserving water for supplying the dry open parts of Liverpool Plains, in the direction of Cox's Creek and the land on the north-east bank of the Namoi as far as near Galathera Plain. The natural watershed is that of the Peel, Namoi, and Manilla rivers, which drain from north to south a watershed of nearly 200 miles around the range, to the most southern branch near Crawney. The northern branch of this area or Manilla River is near Mount Lindsay, as you will see by looking over your map. A dam below the junction of the Peel and Namoi Rivers, at some point near Keepit or Carroll, would intercept all the waters of this immense watershed which comes down in great volume in flood-times and runs down the Namoi, and is lost to the Liverpool Plains district. Above the junction of the rivers above named irrigation could not be carried out for pastoral purposes to any large extent, the features of the country being contracted by the mountain ranges running to the very banks of the rivers in places. This is especially the case up the Namoi and Manilla. On all the three rivers upwards where there is a farming population, the river flats being narrow, a small scheme of conservation might be arrived at for their special benefit. The large supply I contemplate below the junction would supply the Namoi flats on both sides to Narrabri, where the agricultural land ceases to be so plentiful as it is from Narrabri up to Gunnedah; but still there is a large area of wheat-growing land north and east of Narrabri only wanting a small amount of moisture to assure good wheat crops; as for hay for stock there would be no difficulty about growing on each run enough to feed stock in years of drought, such as 1884. I fear that I have drawn on your patience, but trust you will accept as excuse the desire I feel to afford any information and opinions I have formed on your interesting inquiry. If you have got better information, I shall not consider my trouble wasted in not being able to give a greater amount of information. If at any future time I can be of any use to assist your Commission in the way of obtaining local information, kindly command me.

Dam near Carroll.

Taxation.

3982. Do you think that the pastoral holders would submit to taxation equal to the amount of their present losses from drought in order to prevent future losses—do you think that they would voluntarily assist the Government in establishing Water Trusts? My impression is that they would. My experience is that pastoralists do not grumble at anything which is reasonable and which is for their benefit as well as for the benefit of others. We have several taxes to pay now entirely outside of those which are paid by other people in the Colony. It would be too much, however, for me to say authoritatively that they would pay such a tax as that to which you refer.

3983. If you could be assured that, by a well-considered scheme, you could in future depend on water supply sufficient to produce the necessary quantity of artificial food, would you voluntarily submit to taxation? For my part I should be very glad, as far as the small station which I have in the district is concerned, to pay a very high premium for a constant supply of water apart from irrigation.

Nature of soils.

3984. Do you know the nature of the soil on the banks of the rivers in this district? There are various soils; there is a stiff clay which is good for damming, and a black friable soil.

3985. Is the nature of the soil along the banks such that it would be impossible to erect weirs? In all cases of which I know in which weirs, tanks, and dams have been made they have held the water splendidly. There is no doubt about the holding capacity of the soil.

Silting.

3986. Have you noticed any great silting up at the back of dams? Yes, if they are not protected they will silt. If the water is carried well away past the dams they do not silt up. If the soil is loose and a great many stock come to water the dams will silt up very fast, but we generally put in a pit to catch the silt.

3987. Do you know of any cases in which under-sluices have been provided to carry away the silt by scour? I am not sufficiently well acquainted with damming to be able to say; our dams are made in a very primitive style.

Stone.

3988. *Mr. Murray.*] There is not much stone on these plains? You cannot get sufficient to put around your fireplaces.

Mr. William Springthorpe Dowell called in and examined:—

Mr. W. S. Dowell. 9 May, 1885.

3989. *President.*] Where do you reside? At Tamworth.

3990. Have you resided there for any length of time? Over twenty-five years.

3991. You know the valley of the Peel? I know most of the district—200 miles in one direction and 100 miles in another. I know the country as far as Walgett on one side and Armidale on the other.

3992. How far north and south? Not a great deal north, and about as far as Murrurundi to the south.

Peel River.

3993. Do you know the heads of the Peel River? Yes.

Water conservation.

3994. Have you given much attention to the subject of water conservation? Yes.

3995. Have you looked at the heads of the rivers with a view to the conservation of water? Yes; I have often thought that a large quantity of water could be obtained for the supply of various towns, such as Tamworth and Gunnedah, if water were stored at the Bendemeer. There is there a constant flow of water; it drains a great portion of the New England country, and it is full of springs; it is nearly 2,000 feet higher than Tamworth.

The Bendemeer

Conservation and distribution from the Bendemeer.

3996. What are the facilities for the storage of water? I think you could bring it from the river, or put it into large basins, bringing it along by canals and distributing all over the Liverpool Plains. Having such a great elevation, you could bring it down in the ordinary digger's ditch on a large scale to the various portions of the plains in which water would be required.

3997. It would be a means of supplying Tamworth as well? Yes.

3998. Do you think that a supply by gravitation is better than one by pumping? A great deal, in my opinion.

Mr. W. S. Dowell. 9 May, 1885.

3999. Then you consider that there is a sufficient supply for drainage and for storing water to give a supply to the whole of the valley of the Peel? I think that you might say that there is an inexhaustible supply in the Bendemeer; you could lead it in almost any direction by means of canals and reservoirs for the purposes of water supply and irrigation. Independently of a large quantity of water being stored in this way, I think that artesian wells could be got in many places in the neighbourhood. There is one at Tamworth, which, with little more expenditure, could be converted into a large source of supply. I will hand in to the Commission an article I wrote to the Tamworth newspaper on the subject of artesian wells. I think you will find in it some information about a well sunk by Mr. Paterson, of Calrossy. (*Appendix* V.) Artesian wells.

4000. Have you a farm here? Not now.

4001. Have you had a farm? I have.

4002. On the flats of the Peel? On the river.

4003. This country is subject to periodical droughts? Very much. Periodical droughts.

4004. I believe it is impossible to grow any produce? The crops are materially lessened through the droughts, but we generally manage to grow something.

4005. Would there be a great difference between the growth now and the growth you would have if you had water to irrigate the flats? A great difference in favour of larger crops. Irrigation.

4006. What would be the proportion? It is hard to say. You could grow lucerne here all the year round. It is a profitable crop for stock, and you would be able to feed your stock without any labour. Lucerne.

4007. The lucerne crops could be converted into hay if necessary? Yes; or you might give the stock green feed, which would be cheaper than feeding them with hay. Feeding stock.

4008. Supposing there were a market for hay in the lower country in times of drought, that would make the crop profitable? Yes. I may say that, in my opinion, the hills hereabout are full of water; there are springs in many of them, and in the high parts water is constantly bursting out. All this water tends towards the lower levels. Market for hay. Springs.

4009. Do you know of any case in which one of these springs has been utilized? I have utilized one myself—that is Levy's spring—I obtained water from it when I was burning lime. It is about a mile and a half from Tamworth. Levy's Spring.

4010. What quantity of water? I believe there is any quantity of water there. Supply.

4011. You never tested the daily discharge? Only for daily use.

4012. Supposing the Commission sent an engineer here to obtain information respecting the various heads of the Peel River, could you direct him to the particular spots where he would be likely to find natural basins? There are plenty of such places at the head of the Peel River. Natural basins.

4013. You have seen them? Yes.

4014. You could give the information to the engineer which would direct him to the points? Yes.

4015. *Mr. Franklin.*] Do you think the constant supply of water towards Bowling Alley Point would induce more cultivation on the Nemingа Flat? Yes; but I think the great source of supply is to be found in Bendemeer River. Constant supply from the Bendemeer.

4016. That supply does not reach Tamworth? It goes through the country at the back of Rogers' station and comes in at the junction of the Manilla.

4017. How is it that there are chains of waterholes in the Namoi? The water is still travelling down, but it loses itself underneath. Unless there is a very large fresh of snow or other water it is not connected on the surface. Current of water.

4018. If we could retain the water which is constantly discharging from the Bendemeer and discharge it from a higher level on impermeable ground, we could save a great deal of waste that takes place in the Namoi? Yes, I think so. Distribution.

4019. *Mr. M'Mordie.*] Is there impermeable ground? There are plenty of good stiff clays. Stiff clays.

4020. On which side of the Namoi would it be placed to convey any water stored on the higher levels? On the northern side.

4021. It might be conveyed many miles over excellent land? Yes, you could take it across the Breeza Plains. Breeza Plains.

4022. But we should have to cross from the northern to the southern side to do that? Yes.

4023. Do you know the gap through which the Peel River runs its course to the Namoi? I do not know of any range in the course of that river, and I know it from its head to its junction with the Namoi. The Peel River course.

4024. Do you know of any part of the Peel River below Tamworth which is favourable for the damming and the discharge of water to the plains on the southern side? There are plenty of places between Tamworth and Bective. There is a good place about 9 miles from here and another place about 13 miles. I do not see why water could not be stored just below Summer Hill. Storage on Peel River.

4025. Having fixed this place in your mind, do you know of any drainage line by which a canal could be carried? You could carry it along the low range of country on the Liverpool Plains and let it flow all over those big plains through Breeza. Distribution.

4026. Down towards Gunnedah? Yes.

4027. And towards the Brigalow Creek? Yes. I think it would be well worth the while of the Government to test these limestone ranges and see what water they contain. Limestone Ranges.

4028. *Mr. Murray.*] Should we not injure the people on the Namoi if we diverted the course of the Macdonald? I do not think the waters of the Macdonald could be exhausted. I have noticed good floods of water in the Macdonald and scarcely any in the Namoi. The Namoi frequently rises through local rainfalls. Supply of the Macdonald.

4029. At what point of the Macdonald would you discharge it? Where the railway crosses.

4030. How many miles is that from here? About 30 miles.

4031. *President.*] And where would you go from Tamworth? I would go to Attunga and give the Peel River Company and the Manilla the benefit of the water.

4032. Do you know where the Mooki heads? I do not know where it heads—somewhere through the Breeza Plains, I believe. The Mooki.

4033. Do you think that some of the Macdonald waters could be diverted into that course? They could be carried across by the low range I am speaking of. I think some shafts should be sunk at the underground supply in the limestone ranges. The water gets into lower strata from these ranges and empties itself into the sea at Newcastle. I think the water goes both easterly and westerly. Diversion from the Macdonald. Underground stream.

Mr. Joseph Chaffey called in and examined:—

Mr. J. Chaffey. 9 May, 1885.

4034. *President.*] You live on the Cockburn? Yes.
4035. You are a farmer? Yes.
4036. Can you give us any information about the head of that river? It is rocky country—what I should call rotten rocks.
The Cockburn. 4037. Are there large basins and holes? In several places the hills come right into the river.
Storage. 4038. Are there any places where, by damming the river, water could be stored? That could be done all up the Cockburn. There is always water running at Moonbi, and that comes from the heads of the river.
Wells. 4039. Are there wells in the course of the river? There are four wells above Moonbi, at from 16 to 20 feet, sunk through alluvial and gravel.
4040. How far above Tamworth does the Cockburn join the Peel River? At Tamworth.
4041. Do you think that if water were stored in the vicinity of those rivers it would command the whole of the valley? I believe that water could be turned from the Cockburn to supply Tamworth.
Alienated land 4042. Is the country sold in that district? Yes, except in the case of the water reserve. It is an agricultural district.
Value. 4043. What is the land worth? About £20 an acre.
4044. If it were irrigated what would it be worth? Three times as much.
4045. Do you think that land there would be as valuable as in the vicinity of Tamworth? Almost the same.
Muddy water in floods. 4046. In flood-time is the water which comes down the Cockburn clear, or is it full of silt? It is a little muddy for a day or two.
Silt deposit. 4047. Is there any place where the silt deposit forms an obstruction? The river brings down a lot of loose gravel; it is not mud at the top—it is all gravel country with clean ridges like the hills at Tamworth.
4048. Have you a large farm up there? Not at present; all that I have is 80 acres.
Water-rates. 4049. If water were stored at the head of the river and brought down to irrigate these flats, would people be prepared to pay rates for the water? I believe that all of them would do that to have the water on the surface.
Crops in drought. 4050. The country then is subject to droughts? We have grown nothing but wheat during the last few years—we could not even grow a pumpkin last year. You can get a good crop of wheat, because it is off before the dry weather fully sets in.
Wells. 4051. In these wells of which you have spoken does the water not come to the surface? No, it keeps to the level of the river.
Banks. 4052. The banks you spoke of as coming down to the river are composed of rock I suppose? It is all rock after you leave the Moonbi Railway Station.
4053. Are there any swamp flats up near the head? Not that I am acquainted with.
Dam. 4054. Where could a dam be placed? Just above the cultivation.
4055. How broad would the sheet of water be? There is a great fall; the dam would have to be very high to keep back any very large quantity of water.
Flats. 4056. Where else is it comparatively flat about there? Somewhere about the Old Head Station. There is a broad valley taking in 30 or 40 acres.
River bed. 4057. Would you get larger flats nearer Tamworth? Yes, but the land is cultivated. If you dammed the river there you would have to stop the traffic. The river is gravelly except at a point just above the Eight-mile Bridge, where there is a rocky formation—steep hills on one side and a large flat above.
4058. How broad? Three-quarters of a mile.
Current. 4059. Does the river run rapidly there? No, the water would be thrown back a great distance.
4060. What becomes of the water running up there—does it come to Tamworth? No, it goes underneath; it goes behind the hills on the other side of Tamworth.
Subterranean current. 4061. Do you think that where water is coming down off the granite it will continue along the surface of the granite to a lower depth? I think so. As the crow flies it is not more than 4 miles from here to the granite country. There are indications that the water does go to a lower depth.
Cultivation. 4062. What extent of these flats is cultivated? It extends 16 miles from Tamworth. At one place it is about three-quarters of a mile wide, and the hills come close down on the other side. On the average there is about a quarter of a mile on each side.
Crops. 4063. What is the most profitable crop you grow? You cannot depend on anything but wheat.
4064. What would be more profitable? You might grow plenty of hay, but there is no demand for it.
4065. Will lucerne grow? Yes, but there is no demand for it.
4066. But is there no demand for it when there is a heavy drought? Last year cleared out a great deal, but I know of one place in which more than a hundred tons are stored—the owner cannot get rid of it.
4067. If you had a constant supply of water along the line of cultivation I suppose you could grow pumpkins, turnips, and other crops of that kind? Yes, we might grow maize, but there was not a crop of maize last year. I have known it to give a hundred bushels to the acre in good seasons.
Benefit from storage. 4068. Then if there were a system of storage at the head of the valley you would benefit very largely by it? Yes.
Water-rate. 4069. And you would be willing to pay for the advantage of a constant supply? Yes, I believe that all would do so.
Wells. 4070. You are a well-sinker? Yes, I have had some experience in the sinking of wells; I have sunk a good many in the sandy country, in the county of Baradine.
Soil. 4071. What soil did you go through? It is sandstone country; you can get water anywhere in the beds of the creeks—all that you have to do is to sink a well in the creek and log it up.
Sources. 4072. Where does the water come from? It falls in sandy country, sinks underneath, and forms a reservoir.
4073. Is it drift sand down to the sandstone formation? Yes.
4074. You are decidedly of opinion that the water is local, and that it does not come from any great distance? Yes.
Quantity. 4075. Do you get a large quantity of water in those wells? Yes, you cannot empty them.
Quality. 4076. Is it good water? Some of it cannot be used for domestic purposes.
Area of country 4077. What is the area of this kind of country? It is tremendous. It commences at the other side of Garrawilla, and goes in one direction towards Pilliga; I think it goes right across to Mudgee.
4078. It is more than 100 miles across then? Yes. Baradine would run short of water but for the wells which are sunk in the creeks. I have seen wild horses and native dogs get water by scratching in the creeks. You can also obtain large lobsters by digging in the sand. I heard of one hole almost
Fish in sand. filled with sand out of which some large fish were taken. That was in the Cooma waterhole. 4079.

4079. The only way of utilizing this water is by sinking wells and lifting it? Yes. In some places dams can be made, but it is of no use to make dams on the creeks. At Cooper's station there is a fine dam in a gully. Mr. J. Chaffey. 9 May, 1885.
4080. On the plains what sort of soil do you sink through? At Bando they sink through gravel.
4081. Does that come from the river? I think so.
4082. At New Bando there is a well that overflows—where do you think that water comes from? I think it must come out of the sandy country.
4083. The sandy country is higher, then? Yes. It acts upon the plains something like the mountains on other parts of the country.
4084. *Mr. Murray.*] Then in the Baradine country you think that small wells would suit the purpose of water conservation as well as any other system? Yes. If a man has money and industry in that country he need not be short of water. Small wells.
4085. And there is no extensive system of conservation which would suit the country so well? No, except in the black-soil country—there you could dam up the water. I recollect seeing a large overshot dam on the Mooki; it dams the water back for a distance of 4 miles, and I am told that it is never dry. Overshot dam on the Mooki.
4086. Did you ever sink through sandstone in that country? I went through about 20 feet, but we ran short of tools, and as there was no blacksmith's shop near we had to stop.
4087. On which side of the Cockburn is the wheat cultivation? On the south side.
4088. Any system of diverting water for irrigation purposes would have to go on the south side? The north side is not so valuable. I have made a dam at an expense of £30, and I have never known it to be dry.

Mr. Thomas Martin Hole examined:—

4089. *President.*] Where do you reside? Woolomin, on Duncan's Creek, Peel River. Mr. T. M. Hole. 9 May, 1885.
4090. What is the nature of the country there? There are so many different kinds of rock that I could hardly describe it.
4091. Is it hilly country? Yes.
4092. Is it flat about the river? Yes, there are large flats. Duncan's Creek Flats.
4093. Of what width? They vary from 200 to 300 yards from the river back to the hills on each side; they are in some places three-quarters of a mile wide.
4094. Do you know of any points where the hills come down to the river and where dams could be made? Not on the river.
4095. In Duncan's Creek? At the head of the creek there is a large table-land. I have no doubt that a good area suitable for the storage of water could be found; if it could be stopped it would be found that the water fell in a rapid stream down to it—there would be a large catchment. Storage.
4096. What length would the dam have to be? It would be very narrow indeed—not more than 50 or 60 yards wide. Dam.
4097. How far would that throw the water back? In some places it might widen out to half a mile; it would depend on the height of the dam.
4098. Say a 20-feet dam? That would not throw it back very far.
4099. Is it steep? Very steep. I may mention that a very singular thing takes place in this creek: the creek flows and then gradually sinks underneath in dry seasons. At the full of the moon the water appears to be drawn by it—every day it rises and falls again; if it rises at 7 o'clock to-night it rises at 8 o'clock to-morrow night. Tides of the stream in Duncan's Creek.
4100. To what extent does it rise? Sometimes it is drawn half a mile further down the creek than the spot where it ordinarily loses itself.
4101. Where does that water come out again? It comes out again I think in the Peel River.
4102. Do you know where? No; I have seen the creek in strong flood; the water goes down into the bed.
4103. Does it lose itself in sand? No, it is gravelly; I sank about 30 feet down, and I met with water-worn boulders all the way; the water gets underneath into another stratum I think; this stream when running is like a tide; when it gets more power the stream increases in strength.
4104. Has any gauge been established to ascertain the rise and fall of Duncan's Creek at the full of the moon? No observations have been made; I have watched it myself; I have marked it and have followed it down, but I have kept no systematic record.

Mr. Michael Burke examined:—

4105. *President.*] Where do you reside? Tamworth. Mr. M. Burke. 9 May, 1885.
4106. Have you been here many years? Over forty.
4107. Do you know the district? Pretty well.
4108. I believe you know something in connection with Eight-mile Creek? I do.
4109. Is that 8 miles from Tamworth? Yes. Eight-mile Creek.
4110. What length is it? It runs into the Cockburn; it is 4½ miles long. Length.
4111. What basin will that give you? 2 miles across, by about 3 miles in length. Basin.
4112. How close do the hills come together? There is not room for a cart to get between the creek and the base of the hills. Gap.
4113. Would the dam extend far on the crest? I do not think so; the mountains come very close together. Dam.
4114. How far back would a dam 100 feet high throw the water? I think that it would cover the whole of the valley behind.
4115. It would command the whole of this valley, including Tamworth? Yes.
4116. Would it store sufficient water to be used for settlement in the valley? Yes. Storage capacity.
4117. Is the catch very large? Yes, there is a good watershed all round; it forms a complete circle. There is another place at Moore Creek; both places would conserve water, because the bed rock is visible for a considerable distance all up the creeks. Catchment area. Moore Creek.
4118. Moore Creek is down the river? Near Attunga.
4119. Has it a large catchment? Yes.

Mr. M. Burke. 9 May, 1885.

4120. Is there a narrow point for a dam? It runs narrow for about three-quarters of a mile beyond the narrowest point, and beyond that it opens out into a nice flat.

4121. What is the width? The widest place is about a mile; it is about 5 or 6 miles long; it is comparatively level for a considerable distance.

4122. Would water stored there command the valley of the Peel River further down? Yes. I was astonished to hear that Mr. Rogers did not mention this particular spot. These are the principal places with which I am acquainted in the neighbourhood, but I should like to draw the attention of the Commission to a peculiar well about 20 miles from here, on the Manilla Road, at a place called Dead Horse Gully. A shaft was sunk 120 feet and there was no indication of water, although about 80 yards away permanent water is found at from 8 to 11 feet.

Dead Horse Gully.

4123. Any quantity of water? Yes.

Flow of water.

4124. Does it seem to have a flow in any direction? From the hills. They sank the shaft in a hollow, where they thought the water would be found, but they found none; they then sank a tank on the ridge, and that is the place in which water is now found.

Quality.

4125. Is it good water? Splendid.

4126. I believe that there is a stratum coming down along this ridge which contains plenty of water? Yes.

Bores.

4127. Were bores never put down? Not that I know of.

4128. You conclude that the subterranean water flows from the hills? Yes.

4129. And you know of no place where it appears on the surface? None at all.

Cave.

4130. *Mr. Murray.*] Do you know of a cave in the hills behind the town where there is underground water? I have heard of such a cave, but it is a very difficult matter to get to it. The interstices of the rock are exceedingly narrow, and I have heard people say it is extremely difficult to ascertain whether there is water there. I should think that it is a little more than a mile from Tamworth.

Mr. Robert Ralph Lawrenceson examined:—

Mr. R. R. Lawrenceson. 9 May, 1885.

4131. *President.*] Where do you reside? Tamworth.

4132. How long have you resided here? Eleven or twelve weeks.

4133. What is your calling? I am road superintendent; I have charge of the iron bridges at Manilla, Bingera, Bingera Creek, Boggabri, and Gunnedah.

4134. What is the nature of the evidence which you wish to give? I know the Namoi all the way down.

4135. What is the nature of the country from Boggabri to Manilla? It is very rough.

Storage at Keepit.

4136. Have you noticed any spots on the Namoi where large quantities of water might be conserved? I am certain that many such places might be found; there is one, for instance, in the neighbourhood of Keepit.

Flats.

4137. Are the flats of any extent? Not just there.

4138. Are they so higher up? Yes, about Carroll and Gunnedah.

Dams.

4139. Do the ridges come near to the river at any point in such a way as to afford facilities for the construction of dams? I have noticed that they do in several places.

4140. And at those places could the water be thrown back any great distance? At Carroll you could do a great deal in that way. The plain runs right out to Breeza.

4141. Is there any ridge above that which would permit of the storage of water above? I do not think so; it is flat on one side, and you would be unable to get any place where you could construct a short dam.

MONDAY, 11 *MAY*, 1885.

At Gunnedah.

Present:—

Mr. FRANKLIN, C.E.,	Mr. MURRAY, M.P.,
Mr. LYNE, M.P.,	Mr. M'MORDIE, B.E., C.E.

W. J. LYNE, Esq., M.P., PRESIDENT, IN THE CHAIR.

Mr. Thomas Polk Wills-Allen called in and examined:—

Mr. T. P. Wills-Allen. 11 May, 1885.

4142. *President.*] What is the name of your station? Gunnible.

4143. How far is it from Gunnedah? 5 miles—that is, the head station.

4144. On what river? The station is on the Namoi.

4145. Have you lived in this district many years? Nearly thirty.

4146. Have you been following pastoral pursuits most of that time? The whole time.

4147. You have had an experience of the country in its variety of seasons? I have.

Irrigation.

4148. And you have lately made some experiments with irrigation? I have.

Engine.

4149. Will you kindly give in detail your experiments and their result? I have a stationary engine, 30-horse power, which I erected in 1876 for the purpose of sheep-washing, keeping in mind its probable value for raising water for irrigation. From 1876 to 1884 the water pumped up, after it had served the purpose of sheep-washing, was allowed to flow away over the land. The water, although the pumping continued from seven to ten weeks, in some seasons never got beyond a point about half a mile from the pump.

4150. That was because you had no channels in which to convey it? Because it was allowed to flow over the land as it pleased. In 1884, after the water had served the purpose of sheep-washing, I applied it to the irrigation of crops which I had laid down. The result was the production of a crop of wheat for hay exceeding 3 tons per acre, or about 80 tons of hay from 25 acres of land.

Results.

4151. And what other crops? I also irrigated a crop of lucerne. In consequence of irrigation, we have had since the 1st November about five cuttings, averaging about 1 ton per acre per cutting. After the crop of wheat was removed, the land was planted with corn; planting finished in January. The result has been a crop estimated at fully 40 bushels per acre, and a luxuriant growth of pumpkins throughout the corn.

4152.

Mr. T. P. Wills-Allen. 11 May, 1885.

4152. When you commenced to irrigate several years ago, were you sanguine from the results then obtained that it would be a success? It was only later experiments which induced my confidence in it; I was not sanguine, because I had not tried it.

4153. After you had tried it, without making drains to convey water a certain distance, were you sanguine? I was not at all sanguine, except on the principle that water would produce vegetation if rightly distributed.

4154. How long is it since you felt that it would be a success in the end? My success has been assured within the past six months—I have now the fullest confidence. I have been practically irrigating for only six or eight months, and the result has been so thoroughly satisfactory that I have not the smallest doubt as to the issue.

Quality of land.

4155. Is the land you are irrigating more than average land? It is only average—indeed it is rather below the average in point of richness.

Choice of land.

4156. Why did you select that spot? Because it was suitable for a washing-place, and there was an abundant supply of water.

4157. And it was not selected on account of the peculiar richness of the soil? No.

Results without irrigation.

4158. What result do you suppose you would have obtained from that land without irrigation? In such a season as we have just passed through I am sure it would not have returned the seed.

4159. During the time these crops have been growing the seasons have been bad? Yes—exceptionally dry and hot.

Expense.

4160. Have you any idea of the expense to which you have gone in irrigating this land? There has not been £50 expended except in clearing it and in preparing it for irrigation—very little indeed.

Extension.

4161. Are you preparing to extend the area of your irrigated land? A professional gentleman recently took the levels of about 400 acres, with a view to getting the land cleared and laid down under crops. I am so satisfied with the result of irrigation that I have no hesitation in extending my operations; my only fear is whether I am acting within my rights in drawing such large quantities of water from the river.

Effect of pumping.

4162. I was going to ask you the effects of pumping? When there is a fair supply of water in the river it appears to have little or no effect—no perceptible effect.

4163. But at other times? At other times it does not appear to have more than I have noticed in hot seasons from evaporation; the river lowers day by day in hot weather, and during the drawing of water from it there was a perceptible lowering, which perhaps could be accounted for only by the pumping; but there appears to be a general impression that the river would rise to its previous level after being allowed to rest for a few days.

4164. Do you think that if a number of persons residing on the banks were to adopt a system on the large scale you recommend, it would perceptibly diminish the river supply? In a fair season I do not think it would; I think that much of the water drawn from the river for irrigation purposes would find its way back into the stream by percolation.

Value of land.

4165. What would you suppose to be the difference in value of land of the description you have irrigated before and after irrigation? I should think the land would be much increased in value with an available supply of water for irrigation.

4166. What is your idea of the difference? It is a difficult matter to arrive at any value; putting it in another way, however, I am sure that the results from the land would be more than quadrupled.

Crops.

4167. Have any persons in your neighbourhood during this dry season attempted to grow hay or corn during the time you have been growing your crops? Hay and lucerne have been attempted, but I think in almost every instance the crops throughout the district have been failures; the wheat crops have been fair, not immediately round Gunnedah but in the district; attempts at growing lucerne, however, have been an utter failure; in dry seasons like the present, or indeed in average seasons, the growth of maize, when attempted, has always been a failure.

4168. Have you a good knowledge of the country up the river from this point? I have.

Natural basins.

4169. Do you know of any natural basins near the river in which large quantities of water could be stored? Taking the course of the Namoi for 50 miles eastward, the most suitable point I know of is the one which I have heard referred to as having been noticed by the Commission.

4170. Where is that? At a point about 6 or 7 miles above the junction of the Peel, where the Nandewar Range hits the Namoi on its northern bank.

4171. Is that the point at which you understand the Commission have had levels taken? It is rumoured that the Commission have made inquiry about that point.

4172. Do you know of any other points at all similar? I do not know of any to compare with the large results which might be expected from a dam across that point of the river. It is a natural basin, which would extend probably from 10 to 15 miles upward, and which would have a breadth of from 1 to 5 miles.

4173. To what width would the banks require to be dammed? I have no idea; I have not examined the locality. There is a mountain range which comes in almost precipitously to the river on the southern bank, corresponding with that from the main Nandewar Range, hitting the river on the northern side. I do not think they are far apart—less than half a mile.

4174. Do you know of any other points? I know of none to compare with that.

Tulcumba Creek.

4175. None which can be utilized, although not of such magnitude? There is a point on the northern side of the Namoi, the valley of the Tulcumba Creek, where a large storage of water might be obtained, but its watershed would be out of all proportion and unequal to the storage. The watershed is small compared with the storage which might be obtained there.

Cost of resuming land.

4176. Could you give us any idea of the cost of resuming the areas of alienated land which would be covered by water in the event of these several dams being constructed? I could not; it would be a question of the individual value set upon property.

Crown lands.

4177. Is much of it Crown Lands? I think it has been alienated along the river flats.

4178. That is the land which would be covered with water? To some extent; a great deal of Crown Lands would be also covered by water.

Value.

4179. What is your opinion of the value of that land? Its present market value, in the case of conditional purchases, would not exceed £2 per acre.

4180. Do you mean £2 an acre in addition to the balances? Yes; roughly from £2 to £3 per acre.

4181. Do you know of any points in the district, not on this river, where water could be conserved in large quantities? No, I do not.

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4182. Do you think that the principal works would have to be in the basin of the river? I think so. I have an intimate knowledge of most of the district, and I can think of no place which in its results can compare with the place which I believe the Commission have already under consideration.

System of water conservation.

4183. In adopting a system of water conservation, how would you expect it to be applied in the first instance where there are large holdings—would you expect irrigation to be carried out on a small scale, or would you expect the water to be diverted on to the back plains, and utilized for filling tanks and dams? I think that where a sufficient supply of water is available for irrigation, there is not the smallest doubt that it would be used for that purpose, and also for filling tanks.

4184. At once? As soon as practicable.

4185. Do you think that where there is not a large population, the water would be used to grow produce for market only, or to grow produce upon which to feed stock in dry seasons? I think the growers would use it for producing that which appeared to them to be the most profitable, whether for the purposes of market or not; in most cases I think it would be grown for market purposes, because most persons would be interested in realizing as soon as possible after the growth of the crop. Station-holders might grow for the purpose of storing; there would probably be a combination of the two purposes.

Growth of hay.

4186. Do you think that station-holders would be likely to utilize the water to a large extent for the growth of hay, which would be stored for dry seasons? I think that where the supply of water was abundant and could be obtained at a moderate cost, they most assuredly would.

Quality of land.

4187. As a rule, is the land throughout the district sufficiently good for agricultural purposes? I think that large quantities of it are suitable for agriculture.

Quantities for distribution.

4188. Could water be distributed through it? Yes; from a supply at the point I have already indicated.

4189. Do you think that any large quantities of water could be impounded in the river by throwing weirs across it at suitable points, and filling up the channel? Not without the aid of large dams, from which weirs could be supplied; the water-holding capacity of the river is very small; the banks give an

Height of banks.

average height of about 20 feet, and it would probably be about 2 chains wide. The water-holding capacity would therefore be very limited, even if the weirs were at distances of 20 or 30 miles throughout the course.

Diversion from reservoirs.

4190. Supposing a large quantity of water were stored in natural basins at the heads, could it be brought down in the main channel and diverted through the plains as required? That would depend upon the position in which it was required. In some cases it would be required 10 or 15 miles back from the river. In such cases as that the water might be brought direct to the point at which it is required. As far as the banks of the river are concerned, they would be best supplied from the river itself.

4191. By pumping? Pumping would be expensive. Weirs and large reservoirs might be made the means of overflow at particular points. Weirs would be valuable not only in pouring water over the banks, but also for preventing water from running to waste unnecessarily.

Water-rate.

4192. If the persons using the water benefited, do you think they would object to pay a rate sufficient to cover the interest on the money borrowed for the works? It would become entirely a matter of the cost of the water to them. If very costly works were engaged in, and the interest involved the payment of a heavy rate, they would have to consider whether the results would justify it; but where the supply of water would not be too costly, I think they would pay a rate without hesitation. Suppose I put an imaginary sum as to the value of the water per acre. I should say that where land could be irrigated at a cost of from 5s. to 10s. per acre the return would well repay the cost.

4193. And the persons interested would be willing to pay it? They ought to be. The results in my own case prove conclusively that they ought to pay it. The price I have named would be for each separate watering. I mean by irrigation not only watering the land, but inundating it—covering its surface.

Trusts.

4194. Do you think we should have to resort to a system of Trusts to carry out these great works? I have no experience in anything of the kind. I could not say. Doubtless it would be a more methodical way of dealing with the matter.

Silt.

4195. Is there much silt in the river at the time of flood? No; my experience, as regards grass land, is that the deposit is not great; there is a deposit; the current is by no means rapid—when it reaches the level country it loses its force to a great extent.

4196. Do you think that in these natural basins, if a large quantity of water were conserved, there would be much silt to continuously fill them up at time of flood? I do not think there would be a great deal of silt; the source from which these waters are derived is unfavourable to the accumulation of silt. The Namoi, in most of its courses down to the point at which it is proposed to construct this large reservoir, runs through and between rocky hills; the bed, for a great deal of the distance, consists of rocks and boulders; when it emerges from the mountain ranges at Manilla the bed is shingle, and the banks are solid for the rest of the distance; I do not think, therefore, that much silt would be carried down, although timber and débris no doubt would if not burnt off along the banks.

Wells.

Underground supply.

4197. Have you any knowledge of an underground supply through sinking wells in this district near the river? I have sunk a good many wells. The underground supply varies very much. On my own run I have found an abundant supply for watering stock in every instance. I have about ten wells sunk on Gunnible.

4198. Are they at any distance from the river? They vary from 3 to 7 miles.

Strata.

4199. Through what did you pass? Clay.

Depth.

4200. All the way down? All the way until we reached the gravel bed; then we found the water. I have found it at from 30 to 130 feet.

Current.

4201. Have you noticed any current in these wells? Never.

Supply.

4202. Then you think you obtain simply soakage water? Some of the wells give a greater volume than others; some wells, those with gravelly and fine sand bottom, contain only about 4 feet of water, and are inexhaustible by the means I employ, viz., whims and 50-gallon buckets, raising about 10,000 gallons daily; others, with a kind of concrete or cemented clay and boulder bottom, have 40 feet of water in them, and are more easily emptied. I have one well in which there are not more than 4 feet of water, and all my efforts to lower it, with whim power, are unavailing.

Current.

4203. Can you detect no current in that well? There is an inflow; we cannot tell whether there is a current, but the inflow is rapid.

Source.

4204. Have you any idea as to where the water comes from? It would appear to come from the Namoi.

4205. Did you get it about the river level? No, we got it rather below the river level.

4206. Is it at all artesian? I do not think so.

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4207. It does not rise? It rises to a certain height—to the level at which we tap it, but it does not rise beyond that.

4208. It is at that point below the river? Yes. In three or four cases the point at which I have sunk wells has been certainly not more than 30 feet higher than the river, and the shallowest of the wells is 40 feet.

4209. Do you suppose it to be river water if it is found below the level of the river and does not rise up to the level? My only reason for supposing it to be so is that it is unlike the water got at a great distance from the river. I have three wells sunk in the same line; the water is all more or less impregnated with lime—it appears to come from a limestone source. I have no doubt in my mind that they come from the Tulcumba Valley. I sank a well many years ago at the head of the Tulcumba Creek, and the water which I then obtained corresponds exactly with the water which I obtain in the three wells which I have named. There is a low dividing ridge, almost imperceptible, which appears to divide the Namoi waters from the waters of Tulcumba Creek. On the northern side of that low ridge all the water in the wells appears to correspond exactly with the water on the Tulcumba Creek obtained from the wells. On the southern side of the same ridge all the water appears to partake of the character of the Namoi water. In the one case the depth is from 80 to 130 feet—that is on the northern side. On the southern side the depth is about 40 feet. The Tulcumba Creek loses itself when it reaches the plains, except in flood-time, and then it finds its way down and joins the Namoi about 10 miles below Gunnedah.

Storage at the Big Gap.

4210. Are there no points higher up where large quantities of water could be stored? There is a point at the boundary of Tulcumba and Gunnible Runs, at a place called the Big Gap, very suitable for storing a large quantity of water, but the watershed would not be equal to a very large supply.

4211. Have you had experience of wells in any part of this country? No.

Bando well.

4212. You know of no artesian wells? None; I have heard of a well at Bando which is supposed to be artesian.

4213. Where is Bando? In the county of Pottinger.

Underlay of water.

4214. Has it struck you that where water gets out of the river by soakage to a large extent, that there may be a large flow in the higher parts which is lost lower down? I think there is an underlay of water throughout the whole of the country.

4215. Do you think it comes from the river to a great extent, and lessens the volume of water? I decidedly think so.

4216. I understand you have another property, near Walgett—what is the name of it? I have a property near Goran Creek called Killala.

Depression at Killala. Size.

4217. There is a depression there? Yes.

4218. What size is it? I cannot speak accurately about it. From what I have seen, I should say that when it is full it must cover an area of several thousand acres.

Source of supply

4219. Where is the drainage from? It receives its supply from the Bando country.

Nature of soil.

4220. What kind of country is that? Black-soil plains; I should say that as a storage for water it would be perfectly useless; it would be a large sheet of shallow water, easily overflowing on to the plains below. I have only heard of its being filled once or twice, and then, as I have said, it is very shallow. The place is altogether unsuitable for the storage of water.

Opening in the Nandewar Range.

4221. *Mr. Franklin.*] Are you aware of any opening in the range between this and the junction of the Namoi and Manilla? That is the range I have referred to, Nandewar Range, abutting on the Namoi on the northern side; there is another high range abutting on to the river on the south side.

4222. Below the junction of the Manilla? Yes, 15 or 20 miles below.

4223. How far above the junction of the Peel? 6 or 8 miles by the river.

Conveyance of water to the plains.

4224. If it were possible to raise the water to a level above the banks at that situation, it might be conveyed on either side of the river through the plains? The Peel River junction is below—you would have to cross that river; there are also low spurs of the mountains abutting on the river at various points, but it would no doubt be possible to carry out the work you indicate. It might be a little expensive to do so, but there is nothing to occasion any great difficulty.

Storage below junction of the Peel.

4225. Are you aware of any site below the junction of the Peel where, without considering the storage of a large quantity of back water, the ordinary river water might be raised to bring it on to the plains without obstruction? I do not know of any.

4226. None for a weir to embrace the discharge of all the rivers? I do not know of any. It must be borne in mind that there may be places—I do not remember them just now.

Distance of distribution.

4227. Supposing it were possible to convey impounded water across the Peel on this side, to what extent would you be able to lead the distribution towards the plain country? Many miles on the Carroll and Breeza Plains.

4228. Where is the obstruction to your continuing it on towards Coonabarabran? There are dividing ranges. There is a large area on the north side of the river which might be commanded, on the Burburgate, Gunnible, and Carroll North runs country.

4229. What do you calculate, approximately, would be the length of the main channel for that supply through its course? It might be carried indefinitely on to Narrabri and below; it would have no limit—it might go as far as the supply would reach; it might be carried to the western country if the water supply were equal to it.

4230. But you say that it would be interrupted by a ridge? That is in the Coonabarabran direction. Routes might be found by going away from the course of the Namoi. It makes a deep bend from a point near Carroll, and a direct channel from that point to a point near Boggabri would water a great deal of now waterless country.

Direction.

4231. Would you trend westward from that point. No, rather to the north of west.

4232. We are thinking of the south side of the river? That would not be available below Gunnedah, as spurs of ranges come in at various points. There is one at Gunnedah.

4233. That would be the terminal point of the main channel from that source? I think it would. It might be diverted, but its diversion would not be possible more than 2 or 3 miles from the river for some distance.

4234. Do you think it would be well to consider the obstruction of which you have spoken, with a view to see whether the channel could not be extended further away to the westward? It might be worth consideration. The country opens out to the westward at Cox's Creek. I should imagine that all the frontages on the southern side might be better reached by supplies from the river itself than from the main channel on that side. There are numerous abutments on the southern side.

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4235. Do you know the nature of the Bendemeer? I do.

4236. I believe there is a constant flow in that river, is there not? I think it might be said to be almost constant. I have seen it in holes.

Storage in the Bendemeer.

4237. You do not know whether if water were impounded there it would serve the same purpose on the northern side as the course which I am now proposing? You would have greater difficulty in conveying water if it were impounded above Manilla, from that point down, from the hilly nature of the country, than if you started from a point nearer this way.

4238. At this spot, of which we have made some examination, would it be possible to supply water on the northern side? Quite possible; whereas, if an embankment were made at Manilla, or higher up, all the difficulties of carrying water through rugged country would have to be overcome. The proposed site of the embankment is so near the level country that there could be little difficulty in carrying the water from the embankment further on.

Area of country benefited.

4239. You would go right through the Nandowar into the county of Jamison? I am inclined to think that from 100,000 to 150,000 acres of level country would be covered within a radius of 40 miles of the embankment. Taking Carroll on the south, you would have 30,000 acres; Pullamin, 40,000 acres; Gunnible, 30,000 acres; Burburgate, 50,000 acres. The two last are on the north side.

4240. Of the aggregate quantity the larger portion would be on the southern side? North and south would be in about equal proportions.

4241. What is the extent of the channel line towards Narrabri? It would open out in the Jamison county. It might be made right through Nandewar to Narrabri. It might also go through the county of Denman to Mille, and then away towards the Barwon, embracing millions of acres of extremely rich country which is comparatively waterless except by means of tanks and dams. You would pass through country in which there are very few natural facilities for storing water.

4242. *Mr. Murray.*] It would intercept Galathera Plains? Yes.

Settlement.

4243. There is very little agricultural settlement at present along that line? Very little.

Sold land.

4244. *President.*] Is much of the land sold in that direction? A great deal still remains unsold.

Irrigation.

4245. *Mr. Franklin.*] In raising the water on to your land, do you convey it by reduced grade to bring it above the surface and irrigate by gravitation? It is conveyed through channels.

Raising of water.

4246. But are they raised above the surface? They are excavated below.

4247. To irrigate you must get an outflow on the surface at the length of the cut—you can get an outflow immediately after the water has discharged? We do so by blocking the channel and causing an overflow.

4248. Has any other attempt been made to irrigate in a similar manner? The attempt has not been made, but works are in course of construction at Burburgate.

4249. Is the water you draw for irrigation the natural water of the river? Yes.

Reach of water.

4250. What is the extent in length and width of the reach of the river from which you draw? It is a large and continuous reach of water, about 2 miles long, and of an average width of about 2 chains.

Pump.

4251. What is the power of your pump? It is 30-horse power.

Discharge.

4252. What is the discharge? It is a 13-inch centrifugal pump. The discharge is stated to me by the firm from whom I purchased it at 2,700 gallons per minute.

4253. Can you tell me the greatest length of time for which you have pumped continuously at that power and with that discharge? We have pumped for a whole week.

4254. Day and night? Yes.

4255. Without cessation? Yes.

Diminution of water in the river.

4256. Did you notice any diminution of water in this long reach after that pumping? With a flow of water in the river the diminution is nothing, but when the stream has ceased the diminution is very evident.

4257. Would you say an inch? I say it lowered quite at the rate of an inch per day of twenty-four hours' continuous pumping.

Flats for irrigation.

4258. *Mr. Murray.*] Do you think that there are many flats in the district as favourably situated for irrigation as that upon which you have experimented? I think so.

Loss of stock.

4259. Are you aware that large quantities of stock have been lost through the want of grass during the last seven years? I am.

4260. Do you think that if your system of irrigation had been adopted, or if some other system of irrigation had been in existence, all that loss would have been averted? I feel sure that a large amount of it might have been averted.

4261. Can you roughly estimate the quantity and value of the stock lost in these parts of this district for which such a supply of water as I have indicated would be available? In 1877 I feel sure that 50 per cent. of the stock in the Liverpool Plains district died. The later drought has not been so severe; but I am sure, from a careful analysis, that what I say with reference to the drought of 1877 is correct.

Storage of feed.

4262. How many stock would the quantity of hay which you have stored at the present time preserve in case of drought for three months? I have only about 120 tons stored, and that would not go far. I hope to preserve 2,000 tons; then I shall be beyond the danger of drought.

Cost of machinery.

4263. I do not think we ascertained the cost of your machinery? The machinery and appliances for sheep-washing cost £2,500.

4264. You apply the machinery to sheep-washing and sawing as well as to irrigation? Yes.

Water rate.

4265. Would you be content to pay from 5s. to 10s. per acre for water supplied? I should gladly pay 5s. per acre for each irrigation on cultivated lands.

Supply in the Namoi and the Peel.

4266. Are you aware that there is sometimes less water in the Namoi below the junction with the Peel than in the Peel itself? I do not think that is the case. I know both the Peel and the Namoi. I had a run with a frontage to the Peel. I think that the Namoi holds the larger body of water, and has a more reliable watershed than that of the Peel.

Practicability of distribution.

4267. After your long experience you think then that it would be quite practicable to raise water from the river and distribute it over large districts? Without going into the matter very accurately, the work appears to me to be eminently practicable.

Water rate.

4268. And you think that pastoral tenants, as well as free-selectors, would pay a fair rate to cover the interest on the money expended? I think it is peculiarly a measure adapted to the requirements of the agriculturists much more so than to those of the pastoralists.

Mr. Irving Winter called in and examined :—

Mr. I. Winter. 11 May, 1885.

4269. *President.*] You own Tulcumba station? Yes.
4270. Have you resided many years in this district? Eleven years next October.
4271. You have a thorough knowledge of the whole district? Of my own place.
Natural basin.
4272. Is there a natural basin on some part of your run which would be suitable for impounding a large quantity of water? Yes; but I question if you could get the water out after you had impounded it.
4273. Do you think that it is practicable to impound a large quantity of water there at a reasonable expense? Yes, I think you could.
Distances.
4274. How far is it from the plain country upon which the water would be utilized? It is about 17 or 18 miles from this place in a straight line.
4275. But how far from the plain country upon which the water would be most utilized? A mile or two; say 4 miles.
Difficulties.
4276. Do you think that the difficulty in connection with bringing the water out of the reservoir would be very great? I think so.
4277. Why? Because there is a large ridge there.
4278. What would be the great difficulty? To get through the ridge.
4279. But if you followed close to the river could not that difficulty be overcome? There is another obstacle.
4280. Suppose you ran above the bed of the river, but through the same gap? There is a succession of ridges, but one is larger than the rest.
4281. Would it not be possible to run the supply close to the watercourse? I think that it is hemmed in too much. Higher up above the ridge you could go in another direction. There is a point just above Malliwindi where a large storage basin exists; it is at the junction of Spring Creek and the Namoi.
Storage basin.
4282. Does it seem as extensive a basin as the other? No, but you could get the water out of it better than out of the other one.
Catchment.
4283. Is there a good catchment? Yes.
Direction.
4284. If the water were impounded there, which direction would you take in which to utilize it? It would come across through the ridge into Tulcumba Creek. You would require some surveys. I think that the water could be brought down to Gunda.
4285. Do you know of any other points? I do not.
Area of lake.
4286. What extent of country would the artificial lake cover of which you first spoke? 2,000 acres. The country is broken, and you cannot estimate the level.
Land.
4287. Is it Crown Land? There are a few selectors.
4288. Then some of it is alienated? A good deal of it.
4289. I suppose some of it still belongs to the Crown? A great deal of it.
Value.
4290. What is its value? It is very poor; the ridges run so close together that the flats are very small.
Quality.
4291. The land is not very rich? You could get it for about £2 per acre, including the unpaid balances.
Tulcumba Station.
4292. What is the extent of your station? About 80,000 acres.
4293. How far does it run up into the ranges? Up to the heads of the Manilla and Borah Creeks, and the county boundary line between Darling and Nandewar.
Nature of country.
4294. What is the nature of the country? Broken plains. At the head of the run the mountains are 3,100 feet above the level of the sea.
Wells.
4295. Have you sunk many wells there? A good many.
Soil.
4296. What sort of soil did you go through? Clay and rock.
4297. What sort of rock? A kind of trap; I saw in Mr. Czarlinski's room at the hotel a piece of rock similar to that through which we have passed.
4298. And you have to go through that rock to get water? Yes.
Depth.
4299. What depth are the wells? All depths; I think that the shallowest is about 30 feet; they go up to about 160 feet; the alluvial wells are deep.
Supply.
4300. What supply of water do you get? A good deal. It is impossible to pump out one well which I have, although there is not more than 2 feet of water in it.
4301. Does that come through the same kind of rock? No; hematite.
Current.
4302. Can you trace any current in that well? Of course the water runs into it.
4303. But can you trace it going from or going in any direction? Not in any direction; we do not place much dependence on it, as a direction may be seemingly altered by impervious strata.
4304. Is it flowing? Yes; it goes through the well.
Direction.
4305. In what direction does it appear to flow? I should think that it goes from north-east to about south-west. I sank another shaft about 100 yards off and only got soakage water in it. That seems to go to the river.
Source. Supply
4306. Where does the water come from? Out of the ranges, I think. It was originally struck at 20 feet, but by constant pumping we were able to get down to 30 feet. The water will keep at about 2 feet, but in the course of a month or two we shall have to sink again. We had two horses and four men working continuously from Monday morning until Friday night to fill and dig out tank, and they did not lower the water an inch, but it has lowered since.
4307. That would probably be owing to the drying up of the country at the source? Yes, the supply would be lessened in that way.
Irrigation.
4308. On any part of your run is there land which you could irrigate if the water were brought down the river? There is any amount of it.
4309. If a supply of water were available, would you adopt a system of irrigation for the use of the station? I do not know. If I thought that it would pay I should do so.
4310. If it could be demonstrated that it would pay you would? Of course.
Wells.
4311. *Mr. M'Mordie.*] With reference to the current passing through the well, there must be drainage into the river bed? A line of apple-trees denotes the line of the current. It is simply drainage from the mountain into the bed of the river. Some selectors have sunk wells in the low country, but they have not got water. It is a very narrow stream.
4312. How is that known? I had a well within 100 yards of the other well, and I got simply soakage there. There is no quantity of water below the line of the apple-trees. Half a mile above I sank a shaft 60 feet through rock, but got no water. I had another well about a mile to the north-east through about 100 feet of rock, but it has gone dry.

Mr. I. Winter. 11 May, 1885.

4313. So the wells were sunk through different kinds of strata? Yes; the deepest wells are those in the alluvial—they are from 130 to 160 feet deep.

4314. *Mr. Murray.*] Previous experience would lead you to sink in the line of the apple-trees? Yes; but the trees are no criterion, except the water be shallow.

4315. Have you had any experience further down the valley? No.

Irrigation.

4316. Have you adopted any system of irrigation about the homestead? No, with the exception of water being laid on to the garden. I put a mill on the well; it pumped the tanks full and the surplus water ran over the surface, flooding about 2 acres, but the stock would not look at the herbage which grew on it.*

4317. What was the reason? It was too rank.

4318. Would they not eat it if they could not get grass anywhere else? I have taken horses there—they have eaten a mouthful but no more. The surrounding country was absolutely bare at the time.

4319. Is there any property in the water to account for it? I think not; the stock would drink the water.

Mr. George Fawcett called in and examined:—

Mr. G. Fawcett. 11 May, 1885.

4320. *President.*] Where do you reside? At Burburgate. I have been manager of Burburgate station.

4321. For how long? Three years.

4322. Is it a large station? About 300,000 acres.

4323. Is it near the Namoi below Gunnedah? About 7 miles.

Country.

4324. What is the nature of the country generally? There is more timber than plain.

4325. Ordinary box? Yes.

4326. Flat? Flat and hilly; flat near the river.

Irrigation.

4327. While you were manager of the station did you attempt any irrigation works? None.

4328. Have they attempted any since? Yes.

Extent.

4329. To what extent have they carried them? It is only experimental at present. I believe they will cover 170 acres.

4330. Have they actually irrigated that area? They have everything ready. The only drawback is the want of water.

Preparation of land.

4331. How are they preparing the land for irrigation? They have it all ploughed and drained, and they mean to have leaders from the main drain.

Drains.

4332. Are the drains so situated as to be a little above the adjacent land? No, the drains will all be below. They will block the drains at the end when they are full; small furrows will be made from the leaders.

4333. Are the works on the slope? In some places; in others on the high land.

4334. Then the drains are actually higher than most of the lands which it is intended to irrigate? Yes.

Sections.

4335. Are they dividing the land into large sections? Yes.

4336. Very large? Not very.

4337. What sections do they propose to irrigate at one time? The 170 acres are divided into three irrigation paddocks. They have started another paddock about a mile further down, with a view if the present works are a success to continue the drains and to irrigate more.

Extent.

4338. Have you any idea as to what extent they propose to irrigate if the present works are a success? They talk of irrigating land about 2 miles from the head station.

4339. About how many acres? About 2,000.

Pumping.

4340. Do they propose to raise the water by pumping? Yes.

4341. What is the size of the pump? About 10 inches at present. They intend to get another afterwards.

Engine.

4342. Do you know the engine power? 30-horse power.

4343. Have you tried irrigation for agricultural purposes? No.

Success.

4344. From what you have seen of these works do you expect that they will be a success? I think so.

4345. Do you think that if there were an unlimited supply of water at the present time they would be carrying on their irrigation works? I am sure of it.

Water-rate.

4346. Do you think that if water were supplied, the company would be prepared to pay a reasonable sum for it? I think so.

Wells.

4347. When you managed the station had you any experience of well-sinking? Yes.

4348. Are there many wells sunk on the station? About thirty on the south side and about a dozen on the north side.

Soil.

4349. What did you sink through generally? Through clay.

4350. Have you sunk through rock? It has been done in several instances.

4351. And you obtained water? Yes.

Supply.

4352. Any supply? Yes, a good supply.

Current.

4353. Have you ever traced the water as flowing in any direction? It is generally looked upon as river water.

Bed.

4354. What did you get it in? In gravel.

4355. In a river drift? Yes.

Level.

4356. Did you get it at a higher or at a lower level from the river? Generally at about the same level as the river.

Rise.

4357. Does the water rise in the shaft? To a certain extent—about 4 feet I should say. I have known it to rise 30 feet.

Source.

4358. Where do you suppose it came from? It is not river water, because it is not as good water as we are in the habit of getting in the other well.

Quality.

4359. Is it mineral water? It is rather brackish.

Source.

4360. Have you any idea where it came from? I should not say that it was river water.

4361. What is the source? It is not from the river side.

4362. Does it come from higher ground? I should think from the hills.

Irrigation.

4363. What extent of country is there on the station which might be brought under irrigation if water were at command? I should say 40,000 or 50,000 acres.

4364.

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* Note (*on revision*):—This answer refers to the well and tank spoken of at Question 4306.

4364. What is the principal object the Namoi Company have in irrigating so much land in the first instance? I think it is to prepare against loss in time of drought; they wish to have hay at command instead of sending down to Maitland. Mr. G. Fawcett. 11 May, 1885.

4365. They have not made these works for the purpose of grass irrigation? No, but eventually they look forward to that.

4366. Do you think the country will grow lucerne? I believe it would. Lucerne.

4367. Have you had any experience further down the river or in any other part of the district? Only about Burburgate.

4368. *Mr. Murray.*] Have you considered the question of irrigation by gravitation instead of by pumping? No, I have not. Irrigation.

4369. Why did you not consider it? Because the water was not available.

4370. Is there no suitable place for a reservoir high up the river? I do not think that idea was ever entertained; I have no doubt it could be done. Reservoir.

4371. The alienated lands there through which the race would pass would deter private individuals from undertaking the work? Yes.

4372. You think, however, that the work could be done by the Government with satisfactory results to everybody? I believe it could.

4373. And that the people would be prepared to pay a fair share towards the interest on the money expended? Yes. Water-rate.

4374. *President.*] Do you think a system of Water Trusts would be the best way to deal with the question? I think it would. Trusts.

4375. Would it be preferable to individuals carrying out their own schemes? I think so.

4376. Are the floods very extensive on the station of which you were the manager? They have been. Floods.

4377. How far do they go out from the river? On the south side I have seen them 3½ miles, and on the north side about 2 miles.

4378. Is there much current in the river? It is pretty strong. Current.

4379. Have you noticed that the ground near the bank of the river was higher than the land further back? Some of the banks would be. Banks.

4380. Did it ever strike you as being always so? No, I cannot say that it has; I have seen places where the banks have not been under water while the country 3 miles back was inundated.

4381. As a rule, supposing the water were raised in the river to a level with the banks, could it be brought on to land a considerable distance from the river by gravitation? Yes. Distribution by gravitation.

4382. This could be done either by pumping or by water being raised by means of dams across the river? Yes.

Mr. John James Smyth called in and examined:—

4383. *President.*] You are a resident of Gunnedah? Yes. Mr. J. J. Smyth. 11 May, 1885.

4384. Have you lived here long? Yes, twenty-one years.

4385. You have a good knowledge of the district? I have not travelled about it a great deal.

4386. And you know the neighbourhood of Gunnedah? The immediate neighbourhood.

4387. As a rule are the seasons variable here, or have you a run of good and bad seasons? They have all been bad during the last seven years; when I first came here we had very decent seasons—a run of wet seasons—but since then we have had a long run of dry ones. Seasons.

4388. Have you had any experience in squatting? Not the slightest; I have only supplied squatters with stores.

4389. Your experience is confined almost entirely to the town? Yes.

4390. Have you sunk many wells? I have put down two wells myself. Wells.

4391. What was the nature of the sinking? I went down about 35 feet; I came upon water so salt that I filled the well up again; I went through a kind of rotten stone principally, with layers of pipe-clay cement. Salt water.

4392. When you struck the salt water did it rise? Only about a foot. Rise.

4393. Have you formed any idea as to the cause of the saltness of the water? No; I was surprised to find it salt, because 2 chains from where I put the well down there was good water about in a line from the spot at which I sank; 2 chains further on from that there is another well with good water; that is about 40 feet deep. Good water.

4394. Have you attempted other wells? The only other experience I have had has been in the sinking of a well at the Wolseley Park Reserve in town. Well in Wolseley Park.

4395. What was your experience in that instance? The well was bored to 132 feet; there was 77 feet of tubing. Depth.

4396. Did they strike water before they got to 132 feet? I think they got the main supply at 105 feet.

4397. Why did they sink lower? We were in hopes of getting an artesian supply.

4398. Was the water at 105 feet good? It is used by the people in the vicinity of the well for drinking and other purposes; it is 27 feet from the surface. Quality.

4399. Then it is artesian? To a certain extent.

4400. Where does the water rise from? I should think about south south-west of the town. Source.

4401. From hills close by? Yes.

4402. You do not think it has come from any distance? No, I do not.

4403. The finding of salt water in the well on your own property and the finding of good water in the wells close to it would lead you to suppose that the strata of water were different? Yes. Water strata.

4404. Do you think that the water passes through minerals? Yes.

4405. Is there any gypsum about there? I have not heard of any; the majority of wells contain a good deal of salt water. Salt water.

4406. *Mr. Murray.*] What is the depth of the well in which you obtained the salt water? About 30 feet. Depth.

4407. You did not think of sinking to the same depth as that of the other wells in the hope of getting a supply of fresh water? No, I did not.

4408. *Mr. Franklin.*] Did you preserve any of the material at the level at which you found the salt water? No; it is some three years ago; the well was filled in and the remainder of the material was carted away.

4409. Have any persons in this district kept for analysis the material in which they have found salt water? I do not think so.

Mr. John Hawthorn called in and examined :—

Mr. J. Hawthorn. 11 May, 1885.

4410. *President.*] Do you live in the neighbourhood of Gunnedah? Yes.
4411. You are a farmer? Yes.
4412. What area of land do you hold? About 700 acres, conditional purchase.
Area. 4413. Any other land—pre-emptive? Yes.
4414. What area altogether? About 1,200 acres.
4415. Do you live near the river? About 6 miles from it.
Country. 4416. What sort of country is it? It is plain country. I am off the plain, on a slight incline towards the bottom of the mountains.
4417. Is it much above the river? From the Mooki to where my land commences it seems to be pretty level, and from there to the bottom of the hills there is a slight incline.
Levels. 4418. Have you taken any levels to ascertain the height? No.
Cultivation 4419. Have you much land under cultivation? About 40 acres.
Season. 4420. Is this a bad season? I cannot complain of it.
Irrigation. 4421. If you could obtain water for irrigation would you be anxious to do so? I certainly would, if it came within my power to pay for it.
Water rate. 4422. And in proportion to the benefit you were likely to derive you would be prepared to pay? Yes; for this reason,—that in the last two years I have lost a great number of stock from the want of water.
4423. Then you would be prepared to pay for water even for the purpose of filling up tanks and dams? Yes; not only for crops, but for grazing purposes and for stock.
4424. Have you had any experience of irrigation? I cannot say that I have.
Wells. 4425. Have you sunk any wells on your property? Yes, I sank a well upon the property upon which I am now living. I went to a depth of 80 feet, and there I got brackish water.
4426. Did you sink lower? The water was too bad for use.
Tanks and dams. 4427. How do you supply yourself? With tanks and dams.
Rock. 4428. What sort of strata did you pass through in sinking the well? It was soft sinking—the stone was a sort of reddish colour.
4429. Do you know gypsum? I cannot say that I do. When the material was exposed to the air it crumbled away.
Supply. 4430. What quantity of water was there? A very good supply.
Stock. 4431. Would not the stock drink it? Some would, but they did not do well on it; some would perish before they would drink it.
4432. Did you sink wells in other places? No, I did not try. I have sunk wells on the Windebar run, over the range from Gunnedah.

TUESDAY, 12 MAY, 1885.

At Narrabri.

Present:—

MR. FRANKLIN, C.E., | MR. MURRAY, M.P.,
MR. LYNE, M.P., | MR. M'MORDIE, B.E., C.E.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. George Gregory called in and examined :—

Mr. G. Gregory. 12 May, 1885.

4433. *President.*] Where do you live? Bullawaa Creek.
4434. How far is that from Narrabri? 5 miles.
4435. Have you a farm or a station? A farm.
Area. 4436. What area? I have three farms; about 500 acres altogether.
Frontage. 4437. Is it a frontage? It is a frontage which takes Deep Creek for a mile and three-quarters.
4438. On each side of the river? On the north side.
Deep Creek. 4439. Is Deep Creek an ana-branch of the Bullawaa Creek? Yes.
4440. On the Narrabri side? Yes.
4441. Does it run in at a different point from the Bullawaa Creek? Yes, at angles.
4442. Have you been farming to any extent? I have been farming during the last twelve years, but in
Wells. 1860-1-3 I was dam-making and well-sinking on the Killarney Run near Narrabri.
4443. To what depth did you sink wells, as a rule? I sank one well on the Bobbiwa Creek at the foot
Spring. of the mountain, about 2 miles below the original spring.
4444. What was that spring like? It was a constant running spring up to within a few years ago; it
Supply. was always on the surface.
4445. A great quantity of water? Yes.
4446. How long has it ceased running? I cannot say exactly, but during the time I was there and previously it had never been known to be dry.
4447. Did it appear on the plain or in the mountain? On the mountain.
Spring. 4448. How far up in the plain? About 6 miles from the edge.
4449. Was it ever opened out? I was sent up to open the spring; I partly opened it, but I found that the water penetrated underneath and then I stopped the work.
4450. How did you find that out? When I reached the bottom I knew that it was porous underneath, and that the water went underneath instead of coming up.
4451. How long is it since you did that? In the drought in 1862.
ource. 4452. Has the spring been running since? It ran for years afterwards.
4453. Have you any idea where the drainage comes from? It was a main spring from the Saddle Mountains above it. It showed on the top of the ground in a place above. There is another spring some 4 miles above.
Strata. 4454. How far was that spring from Narrabri? I should think about 19 miles.
4455. What did you find in the wells which you sank in the creek below it? Gravel and boulders down to about 18 feet, and then I came to the rock.
4456. What kind of rock? Soft sandstone.

Mr. G. Gregory. 12 May, 1885.

4457. Did you get any quantity of water? No quantity; there was a small soakage on top of the rock.
4458. Did you sink through the rock? I went down 65 feet in it.
4459. But you did not get through? I found the rock getting harder, and then I came to the conclusion that it was the bed rock, but in the meantime I could hear the water running from the well on one side.
4460. Where were you sinking? I was sinking in the rock; after I got into it I could hear frogs croaking and water running. Frogs.
4461. Do you suppose that the sounds came from the interior of the rock? From the top of the rock. I concluded that I had had a rise in the rock, and that the water was running on one side. Sounds.
4462. Did you attempt to drive? I did drive. I spoke to Mr. Doyle and advised him to drive; I drove some distance, and he then said "We will leave this well and sink another on the other side of the creek." I said, "You will hit the rock." We sank on the other side and hit the rock. He was not satisfied to sink where I wanted to do so in order to strike the water which was running, and the place has not been tested since. The drive is still in the well. Driving.
4463. You know nothing more about that well? No.
4464. What kind of country was it about the well? Apple-tree, box, and ironbark. Country.
4465. On the foot of the ranges? Yes; it was the main creek running up the range from the plains.
4466. Did you sink any other wells in the neighbourhood? I sank the Killarney well; it went dry, and I had to sink it a few feet more. Killarney Well.
4467. What was the depth? 28 feet. Depth.
4468. And it went dry? Yes.
4469. How much deeper did you sink it? 2 or 3 feet.
4470. With what result? A good supply of water; there is a hard limestone ridge about there. Supply.
4471. Did that well go dry again? I cannot say; when I sank it the river was dry for a distance of 24 miles in one place.
4472. What kind of soil did you go through in the first instance? I believe that the greater part was limestone and black soil. Strata.
4473. Did you sink any other wells? Not there; I made several dams. Dams.
4474. Where is Killarney Station? About 4 miles from Narrabri, north from here.
4475. Have you sunk any wells anywhere else? I have sunk five or six where I am living at present. Wells.
4476. What strata did you go through? The first well which I sank was in the bed of Deep Creek. Strata.
4477. What did you find? Gravel for about 20 feet and then pipe-clay for about 15 feet, then gravel again for about 2 feet, then pipe-clay again, after that, gravel till I reached a depth of 75 feet.
4478. What did you strike then? Water.
4479. In any quantity? It is not a permanent supply. Supply.
4480. Simply drainage? Yes.
4481. How far out from the river? About three miles and a half.
4482. Do you suppose that the drainage is simply surface drainage? Yes. Drainage.
4483. You did not pass through any rock? No.
4484. Did you come on to any rock at the bottom? No.
4485. Where are the other wells? Another well was sunk in 1840, and it has never been known to be dry. Well, Spring Station.
4486. Where is it? It is at a place called Spring Station, on the Bullawaa Creek, about 300 yards from the well which I have just described; it is through sandstone and coal.
4487. Is it a spring? I believe it to be a spring. Spring.
4488. You have that well still? Yes.
4489. Are you using it? No; the water is hard. Quality.
4490. Does it rise to any height? I employed a man to bale it out; he worked all day with a 5-gallon bucket, and he only lowered the water 3 inches. Rise.
4491. You worked it with a windlass? Yes.
4492. For how long? Ten hours.
4493. What is the size of the well? About 4 feet by 4 feet; it is partly fallen in now; I wanted to bale it out in order to slab it afresh. Size.
4494. Were you ever down that well? No.
4495. Did you ever understand that there was a current in the well? I have an opinion that there is a current in it. I think that it is the main run of water from the mountains. Current.
4496. That is from the Nandewar Range? Yes.
4497. Have you ever tried the effect of the water on the surface—did it kill vegetation? It does not kill vegetation; we drink it, and use it for various domestic purposes. Effect on vegetation.
4498. Have you ever irrigated with it? For plants.
4499. Did it answer for that purpose? Well.
4500. Have you any other wells? I have another well which was sunk last year. Well.
4501. How far from the river? About the same distance—about three miles and a half.
4502. How far from the well just described? About three-quarters of a mile.
4503. In what direction? Nearer Narrabri, west from the other one.
4504. What depth is that one? 92 feet. Depth.
4505. Did you sink it yourself? Yes.
4506. What did you sink through? About 5 or 6 feet of loam, and then I came to the rock. Strata.
4507. The same rock? Sandstone; I followed it down 59 feet, and then I struck a seam of coal 10 inches thick. I forwarded a sample of the coal to the Minister for Mines. It was analyzed, and I was told that it would give a good return. I then came to the coal rock lying in joints underneath and impregnated with copper. I then went down through partly formed coal to the depth of 92 feet. I finally struck water in coal rock. Coal seam.
4508. Any quantity? At the time when I struck it it was not very strong, but since then I have been unable to lower it.
4509. In what direction did the water come from? From the mountains, through crevices of coal rock.
4510. What sort of water is it? Similar to the water in the other well; somewhat salt and hard like all coal water. Quality of water.
4511. Have you sunk the well deeper since? No; there are 32 feet of water in it now, and I cannot lower it. Depth.
4512. What is the size of the well? 4 feet by 4 feet at the top, and 3 feet 6 inches after about 60 feet. Size.

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4513. Do you raise the water by hand? We use 10-gallon buckets and a windlass.

4514. Have you any other wells? I have another at about 400 yards from this point, on the banks of Deep Creek.

4515. When did you sink that? About seven years ago.

Well. 4516. Will you describe it? There are about 17 feet of loam and then about 8 feet of gravel, afterwards 14 feet of pipe-clay, then gravel to the bottom; but the water is different from that in the other wells—it

Quality. is considered the best drinking water in the district.

4517. You did not come to the rock? No.

Rise. 4518. How high does the water rise? About 30 feet.

Soil. 4519. What is the nature of the soil on the surface? Sandy loam.

4520. Do you know the nature of the soil generally throughout the district? Along the foot of the mountains it is a porous sandy loam.

4521. What is the nature of the soil near the river? Clayey.

Holding ground. 4522. Is it good holding ground? When you get a certain distance from the mountains, if you go any depth in the clayey ground, you are likely to go through on to the loam.

4523. Is that near the river? No; it is good holding ground near the river.

4524. How far out from the river? I cannot say exactly; you will find good holding ground at Stony Creek.

4525. How far out does that go from the river? It does not go out above 4 or 5 miles.

4526. Keeping at a distance of about 4 or 5 miles from the foot of the mountains you will find very good holding ground in places, and from that point to the mountains it is porous? Yes.

Agricultural land. 4527. Which do you consider the best agricultural land? The porous land near the mountains by far.

4528. Is that porous land improved or does it yield more in proportion through having plenty of water? A great deal.

4529. Which yields most in consequence of plenty of water? The porous land—there is more chance of rooting in it.

Trenching. 4530. I suppose that if the heavy land near the river were trenched it would be good? It is good wheat land.

4531. And would be improved proportionate to the depth of the trenching? Yes.

4532. Have you been farming on your land? For twelve years.

Crops. 4533. What is your experience of crops? During the last ten years I have had a poor chance of growing anything, the seasons having been so variable, and we have been so short of water; we have been scarcely able to support ourselves.

Irrigation. 4534. During that time if you had had plenty of water to irrigate your land you would have had better yields? About four times.

Water rate. 4535. If water were placed within your reach and if you could obtain it at a fair rate would you be prepared to avail yourself of the supply? Of course if the water benefited us we could afford to pay a fair rate, because taking our seasons here as a rule we are never sure of a crop.

4536. What do you think you could afford to pay per acre if you were sure of getting good crops? I suppose that if there were a good supply of water a person could afford to pay £1 per acre. Of course he would benefit a great deal more than that by it.

Situation of land. 4537. Is your land so situated that you could prepare it for irrigation without incurring any great expense? Yes, the water could all be got on to the high land.

4538. Are there any other farms near you? There are 15 or 16 miles of farms on Eulah and Bullawaa Creeks.

Farmers on irrigation. 4539. Have you conversed with other farmers about irrigation? Yes, and I have found that a great many were inclined to make a start on their own account, but the seasons have been so bad that they have been unable to commence.

Water rate. 4540. Do you think that as a rule they would be anxious or willing to pay a reasonable rate for water? I believe that they would be only too glad to get it.

Extent of land. 4541. Have you any idea as to the extent of land on the north side of the river between it and the mountains? From Maule's Creek to Narrabri there is a distance of about 20 miles; it would average about 12 or 14 miles from the river to the hills up to Narrabri.

4542. That is, 20 by 12 or 14 miles? Yes.

4543. Is it good land? Yes.

Settlement. 4544. Is there any settlement near the range? From Berrioye downwards there are a large number of selectors.

Spurs. 4545. Is there a spur of the mountains at Maule's Creek? At Berrioye, on both sides, the mountains begin to close in on to the river, and after you leave Berrioye and work down towards Narrabri the mountains draw in again.

Selected land. 4546. Is there any other settlement apart from selectors at the foot of the mountains? There are sheep stations, but it is all selected land.

4547. Have you been about the mountains? Yes.

Natural basins. 4548. Did it strike you that there were any natural basins which, by the construction of dams, could be made to impound large quantities of water? I am afraid that the ground would be all too porous; it is mostly loose rock just under the surface.

4549. And you think that the water would get through that rock? Yes.

Depth to rock. 4550. At what depth is the rock from the surface? I could not say; a great deal of loose rock falls from the summits of the hills into these basins; I do not suppose that the depth to the rock would be more than 10 or 15 feet.

Gap at Bobbiwan Creek. 4551. Are the hills close to where the creeks come out? They are very narrow in places and the country opens out above; there is one place at Bobbiwaa Creek; the gap is not above 10 feet wide.

4552. What is the country like above? More open.

4553 Is there a large basin? The creek widens a great deal, and slopes on both sides.

4554. Is there any flat? Yes.

4555. How far does the creek run up above that point? 7 or 8 miles.

4556. For what distance do you suppose that it runs fairly flat? It does not run fairly level, but there is no great fall for some distance.

Dam. 4557. Would it be a great work to construct a dam of from 100 to 200 feet? Yes; the hills do not run that height.

4558. What is the height? From 40 or 50 to about 80 feet.

4559.

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4559. Do you know any similar places in the neighbourhood? No.
4560. Do you think that if water were stored at the heads of the creeks the country along the Namoi could be irrigated? Yes, you would have no trouble in irrigating it if water were stored above.
4561. Are you well acquainted with the country about Boggabri? No.
4562. Do you know anything about the country on the south side of the Namoi? Not a great deal; I have been over it.
4563. Does the land near Boggabri come down near the river? The rocks come right down to the river banks. Boggabri.
4564. Suppose a canal were brought down on the south side from near the head, could you not get past? No.
4565. Could a canal brought from the head of the river be brought down on the north side between the river and the hills? Yes, I think so; it would take a shorter cut. Canal.
4566. If that water were kept on a sufficient elevation near the hills it would command the whole of the plains below? Yes. Command of the plains.
4567. Have you put any dams in any of these large creeks? On the Bobbiwaa. Dams.
4568. What height? 23 feet. Height.
4569. Did you have a bywash? Yes. Bywash.
4570. Did the dam answer the purpose for which it was intended? It was timbered back and front, and when the water came down in full force to the depth of the creek it took the dam away with a sudden rush. Effect.
4571. What was the cause of the dam going? It was put in with dry earth and was not puddled.
4572. Do you think it possible to puddle such a dam across a large creek in such a way that it would stand? Yes.
4573. Would it be possible to put a dam across the Namoi which would stand? I think so, if you formed some place in which the water could get away. Dams across Namoi.
4574. A bywash or sluice? Yes.
4575. Do you know any ridges of rock which run across the river about here on which a dam could be placed? There is one which they call the Rocky Crossing. Rock bars.
4576. How far from Narrabri? Above it.
4577. About what height are the banks of the river there? 15 or 20 feet. Banks.
4578. Would a dam placed there fill up a large area with water? Yes.
4579. Where is the nearest stone which could be used in its construction? There is blue-metal at the Little Mountain and freestone at my place. Building material.
4580. Does the trap-stone run in large blocks at your place? Very large; in fact, there is a mountain of it.
4581. If it had to be quarried? Yes.
4582. Has it struck you that the country along the banks of the river is higher than that at a distance from the river? All the way nearly. Formation of banks.
4583. What do you suppose is the reason of that? The wash from the river; the earth washed up by the rush of water is thrown up on two sides.
4584. Suppose water could be raised by dam to the height of the river bank, would it reach an elevation which would command a great deal of the country back from the river bank? Yes. Effect of dam.
4585. *Mr. Franklin.*] Have you observed the creeks in the loose country over the hills? Yes. Creeks.
4586. Do you think that there is much soakage in the creeks during the time of discharge? Yes; in one or two of the creeks there is a heavy run underneath. Soakage.
4587. You do not find a clayey deposit in the creeks brought down from the mountains? None that tends to make them tight. Deposit.
4588. In your opinion, a canal or channel on the slope could not be made tight by gravitation of clay into it? It would puddle itself in time; the loam is so very fine that it could not help doing so in the course of time; there are places at the foot of the mountains where water will stand for a considerable time after sheep have been on the land. I think that a canal could be puddled to carry water on to the clayey ground.
4589. What is the height of the slope above the general plain? At Bobbiwaa, from 80 to 100 feet. Slope.
4590. *Mr. M'Mordie.*] In the porous basins could not the water be stored by carrying up a dam from the solid rock? Yes; you would have one natural side afforded by the formation of the land. Dam.
4591. *Mr. Murray.*] In the wells which you sank did you notice any underground current? Only in one; I believe it is an underground current. Underground current.
4592. You do not know of any near Narrabri? None except the one at Bobbiwaa which I have mentioned.
4593. What is the average depth to which they sink in the town of Narrabri? From 18 to 30 feet. Depth of wells.
4594. *Mr. Franklin.*] Is there a site about Narrabri where rough rock is seen cropping out above the banks of the river? On the south side; it is of a clayey nature on this side. Rock.
4595. What is the width of the river at that point? The bank is low on this side, and on the other side prominent; the width is from 80 to 100 yards. Width of river.
4596. How far back do you go on the low side before reaching the level of the high side? A considerable distance; it is a gradual slope; to gain the last 5 or 6 feet you might have to go a quarter of a mile. Banks.
4597. What is the maximum rise in flood-time in the highest flood you have known at that site? I should say about 12 feet above the banks; the flood of 1864 was the largest which I have seen in the Namoi. Flood levels.
4598. Have you observed the floods from time to time? From 1860 to the present time.
4599. Have you made any permanent marks? No.
4600. Could you show any of your marks to an officer of the Commission? Not on my own land; I am out of flood reach; I have seen the land near Narrabri under water several times.
4601. Does much water come down the tributaries from the mountains in flood-time? A great quantity. Flood-waters.
4602. You think that it might be intercepted? Plenty of it; there are plenty of places where tanks could be made in clayey ground under the foot of the mountains; by carefully selecting the sites you might with little trouble turn the water from the creeks to fill reservoirs.

Mr. Charles Alexander Ross examined :—

Mr. C. A. Ross. 12 May, 1885.

4603. *President.*] Where do you reside? At Narrabri.
4604. Have you lived here any length of time? Twenty-five years.
4605. You must have an intimate knowledge of the whole district? Yes.

Floods.

4606. And of the floods which have taken place here? Yes.
4607. What extent of country is under water at the time of high flood from the Namoi? Below Narrabri I have seen the water 8 miles wide, but it is narrow except where it is intersected by watercourses.
4608. Have you any station or farming property here? I have none myself.
4609. Have you been living in Narrabri all this time? I have been living in Narrabri for the last five years.
4610. Have you any idea of the area of country lying between the Namoi and the range of mountains on the north side? I have as far as Maule's Creek—I know the country intimately as far as that point.

Available land.

4611. What area of available land is there? I should think back from the river a distance of 15 or 16 miles in some places; that would be about the average.
4612. Do you think it good land? Some of it very good indeed.

Effect of droughts.

4613. Has it been suffering much in dry seasons? During the last five years, to my certain knowledge. I may say that I have been engaged in a business which is dependent on the crops up the creek—I have a mill here.

Produce.

4614. Can you give us an idea of the quantity of grain produced round about Narrabri? The quantity produced during the last four seasons has been very small.
4615. To what do you attribute that? To a certain extent to the dry weather.
4616. What is the other reason? The small quantity of land put under grain.
4617. Supposing crops could be assured, do you think a large area would be put under grain? I think so.

Settlement.

4618. Is there a large settlement in the neighbourhood? There are a large number of settlers, most of whom have very small holdings.
4619. Of course, then, there is the greater necessity for them to obtain as much as possible from their land? I should think so. Many of them have not the capital to enlarge their holdings and to clear their land.

Effect of water supply.

4620. What is your opinion of a water supply which might be more within their reach—would it be of great service? I think the land is good enough to produce any crop if they could get a good supply of water. Following up the course of this creek you can find as good land as any in the country.

Natural basins.

4621. Do you think that at the heads of this creek there are any large natural basins in which water could be impounded? I think so. Wherever you find rocky bars crossing the creeks I should think you might be able to impound water to a considerable extent.
4622. But it is beyond the capacity of these persons, for financial reasons, to do anything for themselves on a large scale? I think so—quite impossible.

Water Trusts.

4623. Do you think that in this district between the Namoi and the ranges there is a sufficient settlement to form a Trust for the conservation of water in the mountains? I think so.
4624. Supposing they could obtain the money from the Government to do such a work at a reasonable rate, would they be willing to undertake it? I think so, most undoubtedly.

Water rate.

4625. From your conversations with the residents of the district, do you think they would avail themselves of a water supply and would be willing to pay a fair rate for the use of the water? I think most of them would. I may say that within the last year or two the cultivation of land has fallen off in the district.

Sheep farming.

Some persons who were cultivating land have gone into sheep-farming. That has been the case, I think, in most instances where people have had the money to enlarge their holdings—they have preferred sheep-farming to agriculture.
4626. Would that be the case if they could be sure of their crops? I think not.

Price of wheat.

4627. In this district is wheat at a price which would pay for its growth? Yes; it is a little better here than at Tamworth, the difference is the railway carriage between here and Tamworth, giving it a slight advantage.

Wells.

4628. Have you had any experience of wells in this district? I had up at Bullawaa Creek some eighteen years ago. I was an overseer there, and we had several wells sunk upon that creek.

Quality.

4629. With what result? A good supply of water at from 25 to 30 feet.
4630. Was it good water? Very good water.

Source.

4631. Was it simply a soakage supply, or do you suppose a spring to have been struck? It was hardly spring water—it did not rise after it was struck; it was more in the nature of an underground current.
4632. Where do you suppose it rose from? At the head of the creek, inasmuch as by following the creek up, even in dry weather, nearly to the head you could always get running water.
4633. Are there wells sunk in or near the bed of the creek? Close to the creek—in most instances within 60 or 70 yards.
4634. Do you know of cases where wells have been sunk at a distance from the creek? No, I do not.
4635. Have you any knowledge of the extent of water flowing underground from the hills—that is to say, as to the width? No. I have seen wells sunk on the opposite side within 150 or 160 yards of one well which we had sunk, and where they went 80 or 90 feet without striking water.
4636. Do you know of any instance where the sandstone spoken of by the last witness has been driven through in sinking for water? No.
4637. Have you had any experience of wells on any of the other creeks? I have had a great deal of experience in the sinking of wells out in this direction. I once managed Dobbikin and Woollabrar Stations; they were comparatively dry in the summer. I sank altogether nine or ten wells and trial-shafts on this station without getting a supply of water.

Depth.

4638. To what depth did you go? 136 feet was the deepest.

Supply.

4639. Did you strike good water in any of the wells? I struck good water in one well, but there was a very small supply of it.
4640. Was it simply soakage? Yes.

Quality.

4641. Was it good water? Very good water.
4642. Is that the only well from which you got water? The only well.

Depth.

4643. At what depth? I struck water first at a depth of 43 feet. We afterwards sank to a depth of 103 feet, but we got no further supply.
4644. Did it flow up all the distance down? At times there was a slight soakage.

Mr. C. A. Ross. 12 May, 1885.

4645. Do you know the Geehan Creek? It is about 30 miles north of Narrabri; it is afterwards known as the Waterloo. That creek runs into the Thallaba, which runs into the Barwon.
4646. Between Narrabri and the Geehan Creek there is a dividing watershed? There must be a division in the watershed, but there is no high range. A stream of water conveyed along the high land between the Namoi and the Geehan Creek would command the country on both sides. I may tell you that from Wee Waa to Thallaba Creek the country is almost level. In the 1864 flood the water was out past Boolcarrol about 20 miles. Flood in 1864.
4647. Are there any dry lakes out in this country between the Namoi and Geehan Creek? Very shallow ones; no deep lake in which any large quantity of permanent water could be stored. There are five or six shallow lagoons. Lakes.
4648. What is the nature of the country—is it good soil? Good grass land. Country.
4649. Would it be suitable for agriculture? I hardly think so. I have no doubt it would be splendid land for agriculture if there was a good supply of water, but it would take a very large supply.
4650. Why do you think so? I have cultivated a little, and I have found that it took a very large supply.
4651. Is the land of a clayey or of a porous nature? It is clay.
4652. Where did you get the water when you were endeavouring to cultivate? From the Geehan Creek.
4653. How long ago? Between 1866 and 1877.
4654. Did you attempt to irrigate to any great extent? Only to a small extent, for a garden. Irrigation.
4655. Did you trench the land? Yes.
4656. What depth of water would it absorb before you derived any good from it? I should say about 3 or 4 inches. I never took any note of the quantity of water I used.
4657. What is your estimate of the difference in the productiveness of soil which is irrigated and soil which is not irrigated—I am speaking, of course, of the extent to which you irrigated it? With non-irrigation in the summer you would get nothing at all; with irrigation I could get a good crop of lucerne and other produce of the kind. Productiveness of soil.
4658. Did it ever come within your experience to find any quantity of water driving from the hills over the bed-rock, or at any depth below the surface? No. About a mile and a quarter from the spot at which I sank the first well at Woollabrar they sank in Myall Hollow a well in which they obtained at 43 feet an ample supply of water. Wells.
4659. Was it good water? Very good water. Quality.
4660. Did it rise in the well very much? No. Rise.
4661. Was it an inexhaustible supply? Almost. They used to let down 250-gallon buckets, and they were filled in a few minutes. Supply.
4662. What is the size of the well? 8 feet by 8 feet. Size.
4663. What was the depth of the water? About 7 feet. Depth.
4664. How did they work? With horses and a whim. They used to work very heavily, sometimes using three horses in a day. Working.
4665. Did they think there was a flowing stream? I was under that impression, and so were several others. Current.
4666. From the hills to the flat country? Yes.
4667. Do you know of any place where such a stream might come out and disappear lower down? No.
4668. Then the water does not rise again anywhere within your knowledge? Not to my knowledge.
4669. At any rate it would be a great distance before the water rose again? Yes. Seeing that they had obtained so good a supply of water, I sank seven trial shafts across what I thought to be the course of the stream, to try to intercept it.
4670. Did you strike the stream? No, I only got a soakage. Soakage.
4671. At what conclusion did you arrive? That the water ran in a narrow channel and that I had failed to find it, or that the strata in which the water was running dipped very suddenly from the well in which it had been found. Channel of under current.
4672. Are there any clays or rock in that neighbourhood which would keep the water down and cause it to dip suddenly? No, this well was in the flat country. From Myall Hollow the country rises both east and north slightly. There are rolling downs covered with trap boulders. Nature of country.
4673. Is it volcanic? To the north and east.
4674. But the water is flowing to the south and west? Yes, I imagine so. Direction of flow.
4675. Has any one else ever struck the same water? Not to the westward of it.
4676. Have they struck it at all? To the east.
4677. Is it the same water? I believe so. It is struck at a higher level going in the same direction south and west.
4678. *Mr. Franklin.*] Do you know the course of the Namoi from the junction of the Manilla? No, I do not know the course of the Namoi much beyond Boggabri. The Namoi.
4679. You know the part near Narrabri well? Yes.
4680. After a considerable drought what is the state of the river at that point? From Broadwater I have known it to stop running altogether; that is a distance of 12 or 14 miles from here.
4681. In that distance are there considerable reaches of water still in existence? Not within that distance. There is a large reach of water just beyond Broadwater. Reaches.
4682. Are there any waterholes in that distance? There are some now. Water-holes.
4683. What is the nature of the deposit in the bed of the river between those waterholes? Sand and gravel. Deposits.
4684. Do you know whether any attempt has been made to draw water from these sandy deposits? I do not.
4685. You do not know that they have touched the water at any depth? No.
4686. *Mr. Murray.*] Do the floods which you have mentioned remain long over the country? The only flood which I know thoroughly well was the flood of 1874; then the water remained at its greatest height for five days. Floods. Duration.
4687. Did the great body of the water escape by the bed of the river or through the ground? I think through the ground; the body of the river does not seem to cover one-third of it. Escape.
4688. From that you conclude that there is a great underground supply? I imagine so. Underground supply.
4689. Have you heard of any wells in that neighbourhood in which running water is tapped? No.

Mr. C. A. Ross. 12 May, 1885.

4690. Is the flow of water which escapes very large? In flood-time.

4691. To what do you attribute the small number of agricultural farms here? To the uncertainty of the crops.

4692. If you could be supplied with water those crops would be greatly increased, would they not? I think so.

Crown lands. 4693. There are plenty of Crown Lands? Yes, and some of the land is very good, quite equal to the land on the Hunter.

Escape of water. 4694. Do you know of any point on this river where the water seems to get away when it is low: supposing there is a good body of water up the river and a small body below, do you know of any point between where the water could get away into underground strata? I do not.

4695. Has it been noticed that in a dry time the volume of water down the river was less than at a certain point up the river? Yes, below Wee Waa the river is small in comparison with the river here.

Sandy bed. 4696. It is a sandy bed? For miles it is sand and gravel.

4697. And does the water appear again on the surface, or does it get away altogether? I think it gets away altogether.

4698. You think that at a point somewhere between this place and Wee Waa it gets away altogether by soakage? Yes.

Mr. Charles Eather called in and examined:—

Mr. C. Eather. 12 May, 1885.

4699. *President.*] You live in the neighbourhood of Narrabri? In Narrabri itself.

4700. For many years? Since 1841.

4701. Have you lived in Narrabri all that time? Nearly. I have lived on a station at Henriendi.

4702. You have seen all the floods in the river during that time? Yes, a great many.

Floods. 4703. Did they extend a great distance out from the river? Yes, down this way, but they did not higher up.

4704. Does the country rise to a height to prevent their extension far out? Yes, it is a basin. It spreads a good deal on this side of the Rock; at Turrawan it spreads most on the northern side of the river.

4705. Is that above Narrabri? 15 miles from here.

4706. What does the Rock take its name from? The proper name is Coobabindi.

4707. Is that on the south side? No, it is on the north side; it is a ridge coming right into the river.

4708. It would prevent any canal being brought past that point from a point higher up? Yes.

4709. From that point it spreads out on the north side? Yes; you get down 5 miles and then it spreads out.

4710. What is the width in flood-time? In 1864, at this side of the Rock, I believe it spread out to 20 miles, at Baanba 8 miles, and at Baanba North 12 miles.

4711. How much does it increase lower down towards Narrabri? It increases more and more—I have seen it 30 miles wide. On the south side it does not spread much for some distance, but on the north side it spreads a great deal.

Nature of soil. 4712. What is the nature of the soil down the river from and above the Rock? Black soil in places. At 1 mile on this side of the Rock from one ridge to the other, including the river passing through it, there is a width of half a mile.

4713. What kind of country is it above there—is there any good country? Yes, this side of Guligal and this side of Gunnedah.

4714. Above that point on the south is there any extent of good country? Not till you pass Boggabri, 4 miles above the Rock.

Dam. 4715. Supposing the river were dammed at this point, would it throw back a large quantity of water above? It would spread it out on the north side immediately, but it would not do so on the south until you get 4 miles up.

Area. 4716. What extent of country would be covered with water on the north side? An average of about 12 miles.

4717. How far would it run back if it were raised 50 feet above the fall of the country? It is pretty level; there is not much of a fall just there. I could not tell exactly how far back the water would go; it is a question of levels.

Command of country. 4718. Supposing any work of that kind were carried out, would the water impounded there command the whole of the country in this direction? I think it would.

4719. Have you any knowledge of the hills about here? Yes.

Natural basins. 4720. Have you been up the creeks which come from these hills? Yes.

4721. Did it ever strike you that large quantities of water could be impounded in natural basins at the heads of these creeks? I never thought of such a thing.

Snow. 4722. Is it usual for snow to lie on the mountains? I have seen it do so at times.

4723. But not to any great extent? I have seen it only two or three times since I have been here; then the hills have looked as white as paper.

Wells. 4724. Does it lie for any length of time? I think I have seen Mount Lindsay white for about a week.

4725. Have you had any experience in well-sinking in this country? Very little.

Underground streams 4726. Have you heard of any underground stream of water which apparently runs from the hills to the lower country? I have known creeks to run underground for some distance and then rise again.

4727. Have you known of an extensive stream of water which loses itself and does not reappear? No, I have not.

Farming. 4728. Do you think that any extensive farming operations would be carried on here if the farmers had the advantage of water supply? I do.

4729. Do you think they would avail themselves of a supply of water if they could obtain it at a reasonable cost? I do.

Irrigation. 4730. You have had no experience in irrigation? I have had none. I know that the land will grow anything if we can get water.

Banks. 4731. Did it ever strike you that the country on the banks of the river is higher than the plains away from the river? Yes.

4732. You do not know the reason? I cannot account for it.

4733. If the water were dammed in the river to the height of the banks, could a great deal of country along the banks be irrigated? I should think so. Mr. C. Father.
4734. *Mr. Franklin.*] At a place called the Rock, does the rock crop across the river? No, it comes down to within a few yards of the river. 12 May, 1885.
4735. What is the nature of the deposit in the river at that side? It is gravel. Deposit.
4736. Below that point there is a creek called Maule's Creek? Yes. Maule's Creek.
4737. Is that deeply cut in the alluvial? No, it is not.
4738. Is there a great fall in that creek towards the river on the flat? No; there is a great fall higher up. I have known the water to come down with such speed that it has run up the river the wrong way for 7 or 8 miles. Fall.
4739. It would be a kind of back-water? Yes.
4740. There is a tributary to that creek known as the Horse Arm? Yes. Horse Arm.
4741. Is it not shallow at the junction of that tributary? It is.
4742. It would give you the idea that the ground is lower there than when you approach the river? It does.
4743. Do you know of any obstruction on either side which would interfere with the formation of a canal? I do not think you can form a canal up there above Broadwater. Canal.
4744. If a dam were made at that site, would there be any probability of the water flanking the dam? It could not get round. Dam.
4745. You are acquainted with the course of the Namoi between Narrabri and its junction with the Manilla? Yes. River from Narrabri to Manilla junction.
4746. What would be the saving of distance if you took a direct cut from the junction of the Manilla to this point, as compared with the course of the river? I have gone from Henriendi to Manilla in about 40 miles.
4747. Does the bed of the river change much in the time of flood—is the silt deposit shifted in large quantities? I know of some places where there are big holes which have never been known to be filled up during flood. Silt.
4748. *Mr. Murray.*] I suppose the greater supply for the Namoi is from the Nandewar Range? From Manilla, and up that way. Supply.
4749. Where do the great floods which spread over this country come from? From the Bendemeer, the Peel, the Mooki, Cox's Creek, and other watercourses in that direction. Origin of floods.
4750. In this locality, could the tributaries of the Namoi coming from the Nandewar Range be intercepted and made to store a large quantity of water? If that were done I think the population would increase a great deal, and Crown Lands which were suitable to agricultural purposes would be taken up. I also think that the pastoral tenants would be inclined to make use of the water, and would be satisfied to pay a reasonable rate towards the expense of storage. During the last few years we have lost a great deal of stock from drought; within the last seven years hundreds of thousands of stock must have died from that cause. Water storage. Loss through drought.
4751. I suppose they would not object to pay a rate equivalent to about one-quarter of the value of their loss, in order to prevent that loss altogether? No. Water rate.
4752. *Mr. M'Mordie.*] If water were available for irrigation, what would be the principal crops grown in this district? The most difficult thing to grow here is maize, but we could grow that with plenty of water; the other crops would be wheat, barley, lucerne, pumpkins, potatoes, and all other sorts of vegetables. Irrigation crops.
4753. At what season of the year would water be required for those crops? It would not be required every year.
4754. But in dry seasons? From spring to autumn.
4755. You would not want much in the winter? A very little rain suffices in the winter. Rain season.
4756. When are your principal rains? They used to occur in February, but now we get none at all at that time. The heaviest rains are generally in February and March—not in the winter-time. The largest floods we have had have been in those months.
4757. *Mr. Murray.*] Is the country at Boggabri very poor? No, it is very good.

Mr. Charles Collins called in and examined:—

4758. *President.*] You are the Mayor of Narrabri? Yes.
4759. Have you lived here long? Eighteen years. Mr. C. Collins.
4760. What is your opinion of the land in the valley between the Nandewar Range and the river? It is splendid land; most of it is fit for agriculture. There is a large quantity of land open for irrigation between this place and Walgett. If a water supply were carried out, most of the land would be under the control of any water which might be impounded. There is a large settlement in the neighbourhood of Narrabri. 12 May, 1885. Quality of land. Settlement.
4761. At what points? Underneath the ranges and along the river on the north side.
4762. On the south side too? Not so much; the land is not so good until you get past Pilliga.
4763. Do you think the population would increase to any great extent if the crops were ensured by a supply of water? I am certain of it; that is all we want to make it a good country. Increase of population.
4764. You are well acquainted with the course of the Namoi? I know it from here to Walgett, and from here to Gunnedah. The Namoi.
4765. Have you noticed that the banks along the river are higher than the back country? I think they are. Banks.
4766. Can you account for it? In flood-time the earth is thrown up and remains there.
4767. Is it possible to dam the river at various points? Yes; it was suggested to me a few years ago to open a scheme which would permit of irrigation, but we found that it would cost too much money and we abandoned it; it was beyond the means of the people in the district. Dams.
4768. Do you know of any rocky bars at which dams could be thrown across the river? There is one about 3 or 4 miles up from Narrabri, also down by Yaraldool, and others at Bugilbone and Mille. Rocky bars.
4769. Are the rocks laid bare in the bed? Yes, you can see them.
4770. Do they rise from the river on either bank? They do at Yaraldool.

Mr. C. Collins. 12 May, 1885.

4771. If a weir were thrown across the river, would it prevent a new channel from being formed? I think you might put it across the river there without any danger of a new channel being formed.

4772. Then you think it would be quite practicable at various points to dam the river by means of weirs with a sluice and yet avoid the formation of new channels? I do.

4773. You think the nature of the land is such that it will stand a weir? I do.

4774. Supposing that were done and no locks were put in the river, would any injury be done to communication, provided a railway were run in the neighbourhood of the river? Certainly not.

Navigation.

4775. Do you think that a railway from Narrabri to Walgett would obviate the necessity of keeping up the navigableness of the river? We all know that water carriage is far cheaper than railway carriage. The Member for the district has endeavoured to get the river snagged on this side of Walgett. There is no doubt that if that could be done water carriage would be far cheaper, but I do not think it would do away with the necessity for a railway.

4776. If a line were constructed, would there be any necessity for snagging the river? I do not think there would be any necessity.

4777. Then the throwing of weirs across the river at various points would not be so objectionable? Certainly not.

Irrigation.

4778. Do you think that the navigation of a river should take precedence of the use of the water for irrigation? Not in this dry country.

4779. Supposing the river were dammed at various points, do you think that the water would be used for irrigation in the vicinity of the river? I think so.

4780. Do you think that, where the country is in the hands of large proprietors, the water would be utilized to any extent for the growth of crops for reserve feed in time of drought? Certainly.

Fodder. Loss in stock.

4781. If a large quantity of fodder were grown and reserved, would it have the effect of preventing the great mortality of live stock which takes place in dry seasons? I think that there is no doubt about it. During the last two or three years about £200,000 has gone out of the district for forage. Of course it would only save the large stock—it would not save the sheep.

Market. Price of forage.

4782. Supposing the country higher up the river were placed under irrigation and crops were grown, would there be a larger market here if prices were reduced to keep the stock alive in dry seasons? I think there is no doubt of it. There would be a great advantage in having a line constructed to Narrabri from this place for the purpose of getting forage out to stations at the back. Sometimes they pay as high as £15 or £20 a ton.

4783. That is a price which is beyond the reach of graziers for the purpose of keeping sheep alive? Yes. The sheep have been kept alive principally by cutting down the scrub.

Agricultural land.

4784. Have you any idea of the area of good land which would be brought under agriculture in the valley between the Namoi and the Nandewar Range if a system of water distribution were adopted? I think the whole of the land on this side of Walgett—on that side of the river—would be brought under cultivation.

4785. What is the distance? About 120 miles. It would be 50 miles in width.

Area.

4786. What area of land from Narrabri upwards would be brought under cultivation? On the north side, I suppose nearly the whole of the distance from Narrabri to Gunnedah.

4787. To what distance? About 50 miles.

4788. What would be the average width? From 12 to 15 miles.

The Gehan

4789. One witness to-day said that when you got about 20 miles from the Namoi the water fell towards the Gehan? Yes; that is on the road to Moree.

4790. Is the country from the Namoi to this creek good? Yes.

Ball Hill Ridge.

4791. There must be an elevated ridge between the Namoi and that creek? I suppose there would be; at a distance of about 20 miles there is a ridge on the plains called Bald Hill, and there are some other ridges further on.

4792. These ridges would divide the watershed? I suppose so.

4793. Are the ridges continuous? The one called the Bald Hill is a large mountain of stones.

4794. The elevation is higher than the Namoi and the creek? Yes. A supply of water on that ridge would command the country on both sides.

Thalaba Creek.

4795. How far does the Thalaba Creek run down? I have not been down there. I believe it runs about 50 miles to its junction with the Barwon.

4796. Throughout the whole of that distance the country is of a nature which would permit of the carrying on of agriculture? Yes; all that is wanted is water.

Distribution of water.

4797. If we connected the lower ridges, could we discharge the water around them? There is nothing to prevent the discharge right or left.

Underground supply.

4798. *Mr. Murray.*] Do you know of any underground supply which is proved by well-sinking? It has been found, I think, that when the creeks and rivers got low the wells have also got low, and that when the water has risen in the river the water in wells has also risen.

4799. That is in the neighbourhood of Narrabri? Yes.

Wells in river-bed.

4800. That leads you to suppose that the water comes from the river? Yes.

4801. *Mr. Franklin.*] Have they attempted to get water from the deposits of sand in the river bed? Last year we made application to the Minister to have some wells sunk in the river between here and Walgett. I believe the water could have been got at about 12 feet, and at some places at a less depth, but that is about the average.

4802. What means would you employ to keep out the sand when you were sinking? I think it could be done by putting down timber. The squatters have some dams along the road, and they have allowed carriers to take water. It becomes a very serious matter in these dry seasons.

4803. You do not know whether water is to be found in the open ridges at the same level as in the sand? No, I do not.

Mr. John Brake called in and examined:—

Mr. J. Brake. 12 May, 1885.

4804. *President.*] Where do you live? On the Deep Creek.

4805. Do you live near Gregory? About a mile from him.

4806. What evidence are you in a position to give to the Commission? I can give them information as to well-sinking. I have sunk a well at my place, and I have been trying to irrigate. I am down to 38 feet in the drift. I boxed the well for 4 feet 6 inches, it being 3 feet 6 inches in the clear. It was too small for working and prevented me from getting down lower. I am now erecting a windmill—it is nice soft water—close alongside of the bank of Deep Creek.

Wells. Deep Creek.

4807. Is the water coming along the drift of the creek? It is too low; the creek is not more than 15 feet deep. There is an arm in the creek there, and I am on the point. I cut drift and sand when I was about 4 feet from the surface; that went down to 40 feet; from that I got a seam of clay to 63 feet, and then gravel and cement; the water was on the top of the cement. Mr. J. Brake. 12 May, 1885.

4808. That is the water you are using? Yes, some of it. After I broke through the cement it became looser until I reached my present level. I had to screw the box down in order to work. The water rose up to the level at which I first struck it; it ran along the cement under a band of clay. Rise.

4809. Did it rise at all when you first struck it? Not more than 18 inches.

4810. Have you prepared any land for irrigation? About 14 acres. Irrigation.

4811. In what way did you prepare it? It does not need much preparation; there is a natural fall for gravitation.

4812. Is it very steep? There is a very little fall. About 3 or 4 chains from the well there is the greatest fall, and then there is just enough for the water to run and that is all. Fall.

4813. What area would that command for irrigation? About 50 acres belonging to me. I have only 98 acres. Area.

4814. Do you consider that if you could command 50 acres it would give you sufficient farming land on which to live? That is my impression.

4815. What area can you live on as the seasons now are? Anything under 1,000 acres is not of much use; it is very hard to get a living out of that.

4816. Then you consider that the advantage of irrigation is so great that, whereas you could not live on a farm of 1,000 acres without irrigation, a farm of 100 acres would be sufficient if the land were irrigated? Yes. To show you the advantages to be derived from irrigation, I may mention that I had three-fourths of an acre of grapes. Last year we had not quite the average rainfall of 18 inches; the year before from April to April, we had only 3½ inches of rain. The effect upon the vines was that they came out into leaf and that we had a very few grapes, none fit for market; I had one vine, however, which I watered, and upon that there was a very prolific crop, the grapes being of a very large size; my idea is, that if I could get sufficient water I could grow grapes to any extent. Advantages from irrigation.

4817. Have you tried the effect upon any other crops? Yes, I allowed the water to flow over some wheat land.

4818. Where did you get the water from? From the well; I got it up with a horse, and ran it over the land by gravitation, on a small patch of about 3 or 4 roods; I wished to try the effect; it does not answer when wheat is in the young stage; it causes the ground to crack; the soil opens, and if the sun comes out strongly the roots are destroyed; it will have a beneficial effect however when the wheat is in flower; when it is just coming into grain it will have the effect of filling the heads. Source of water. Time for irrigation.

4819. To what depth did you plough the land for the crops? With bullocks for 2 inches and with horses afterwards for 6 inches.

4820. If the ground had been trenched and ploughed 2 feet would the water have a better effect? Yes, because the subsoil would retain it longer. There are portions of land, however, which it would not do to plough to the depth you mention, on account of the clay which you would get about a foot or 18 inches down. Trenching and ploughing.

4821. But suppose you allowed the clay to mix with the top soil, would it not have a good effect? No; it cracks and runs together again.

4822. What would you be prepared to pay per acre for plenty of water for irrigation purposes? I could give you that information better when I discover what I am able to do with the well. I believe that if we had sufficient water we could grow potatoes twice a year. Water rate.

4823. What is your own idea of the value of irrigation per acre? I should say £1 an acre per annum for grass or crops.

4824. Is there no water to be had in Deep Creek higher up than your place? Yes.

4825. Could it not be conserved and brought down to your farm? Not in Deep Creek, but it could be done from Bullawaa Creek. The whole of the country on both sides could be irrigated. A great extent of water comes down from Bullawaa Creek in flood-time. There are bars running across the creek, and if you made some clay puddling the water might be raised to a much greater height than it is at present time. Water conservation on Deep and Bullawaa Creeks.

4826. Are there many farmers there? Yes, on all the creeks, and the result will be the same in each instance if they are all supplied with water. They would be in a position to increase their products tenfold. Farmers.

4827. You would be satisfied to pay a fair share towards the cost of irrigation? Of course the only thing we should have to consider would be how to find a market for our produce. When there is a good season here we have more produce than we can find sale for. Water rate. Market.

4828. Do you not think that the extension of the railways from this district westward would open up a large market for your produce? I think so, decidedly. I believe Narrabri is the furthest point west at which crops could be grown. The soil and climate are of a different nature down on the plains, and there is a terrible amount of evaporation.

4829. Do you think people in this neighbourhood would store up much of their crops against bad seasons? That all depends on their account at the bank. They may be compelled to sell at whatever price they can get. Storage of crops.

4830. But if they were not compelled to sell, and produce was at a low price, they would naturally store their produce for bad seasons? I think so. With reference to the evaporation which takes place on the plains, I may mention that when I was at the Government tank at Gallathra the drinking tank had about a foot of water in it. I made a little hole and wished to draw off the water for my own consumption. When I left the place one morning there were about 2 inches of water, and when I came back in the evening it had all dried up. The reason why I think that that was evaporation and not soakage was because on that night there was a thunder-storm, which I think was caused by the evaporation which had taken place. Evaporation.

4831. *Mr. M'Mordie.*] But it would not be surprising for 2 inches to percolate into the surrounding land, would it? It had had water standing on it for some time before; it was not as if the water had just been run on to it and could soak away.

4832. You had not made the channel between the holes on the same day? No; it had been made some time previously.

Mr. James Moseley called in and examined :—

Mr. J. Moseley. 12 May, 1885.

4833. *President.*] You have a station? Yes, Tibbereena.

4834. This is a considerable property I believe? Tibbereena is not a large property; but other properties which I have held and resided on for the past twenty-five to thirty years have been larger.

4835. Have you lived here for many years? About thirty.

4836. And you have a thorough knowledge of the district? Yes.

Dry seasons.

4837. You have witnessed a series of extremely dry seasons at various times? Yes; we had dry seasons in 1858 and 1862; there were also very dry seasons in 1866, 1868, and 1869; we were very fortunate then until about 1877 and 1878, when we had dry seasons. 1879 was the last wet season.

4838. Is this the longest series of dry seasons you recollect? It is not the most severe drought; we never had such a continuation of dry weather as we have had in the seasons from 1880 to 1885; we have never had the Namoi to its banks in those years.

Loss of stock.

4839. There has been a great loss of stock during that time? Yes, especially during the last two years.

4840. Has it been greater than has been known before? Undoubtedly; it has been caused by two things; there has been much more stock to die, and much more stock to eat the grass. I think that the deaths are about three or four to one in comparison with the numbers which have died in any previous drought.

Causes.

4841. Has this loss been occasioned in a great measure by the want of water or by the want of grass, or by both? No doubt both, for this reason,—that a great quantity of stock which would have just pulled through the drought weakened themselves by struggling in boggy land.

Irrigation.

4842. Has irrigation ever been attempted on a small scale by any residents with whom you are acquainted? Only on a small scale. I have irrigated about half an acre by means of a windmill.

4843. Do you raise the water from the river? Yes.

4844. Did you prepare the ground for irrigation? Only in a very rough way.

4845. You have never trenched it? The ground has been trenched, *i.e.*, dug to a depth of (say) 2 feet, as for trees, &c., but not trenched properly as for irrigation.

4846. From your small experience did you demonstrate that the use of water would make the land productive? Undoubtedly. The Chinese garden over the creek is an instance of what may be done by irrigation, and of course they only use hand labour, although they irrigate thoroughly.

4847. Without irrigation the plot of which you speak would not produce anything? It would not have produced a cucumber in the last three years.

Available agricultural land.

4848. What is the extent of land available for agriculture in the valley of the Namoi as far as Gunnedah, or any other point which you like to name? I should think you could safely reckon on an average of about 50 to 60 miles in length; the average width would be about 10 miles, that is between here and Gunnedah on the north side; by clearing scrub you might get as much again.

4849. Do you know the country above, at the head of Breeza Plain, up the Mooki? Yes.

4850. What distance from Gunnedah would that be? About 50 miles up to the heads of the Mooki and other streams forming tributaries to Namoi from that watershed, though much more to any of the other heads of the Namoi, *i.e.*, Namoi, Manilla, Macdonald, Peel, &c.

4851. Is it level country? In the train you run right along the plains until you get past the Willow-tree.

4852. What is the average width of that country? It is enormous; you take all the heads of the Mooki; the average on both sides would be 25 or 30 miles by about 40 in length, *i.e.*, say 10 to 15 miles wide on each side, from Breeza upwards. In some places you would get half-way to Bando before the fall comes in. Cox's Creek would be just the same.

4853. Then we have blocks 50 by 25 miles above Gunnedah, and 60 by 10 miles below Gunnedah? Yes.

Results from impounding water.

4854. Suppose it were possible to impound a large quantity of water on the different rivers in such a way as to get to the plains, do you think that the whole of that country could be governed by a system of irrigation? It would be difficult to say. I should imagine that a large proportion of it might be. A large area of this country might, owing to the irregularity of ground in elevation &c., be unfit to irrigate.

The Mooki.

4855. Where does the Mooki discharge? Into the Namoi, just above Gunnedah.

4856. Is it a flat creek? It comes down right through the plains; that is, flat while crossing the plains.

Nandewar.

4857. Have you an intimate knowledge of the Nandewar range near Narrabri? Yes.

Basins.

4858. Do you think that there are large basins there which could be utilized for the storage of water? I showed one place to Mr. Gipps at the head of Spring Creek; you would require about a mile of a dam there; this extent is only as guessed by Mr. Gipps and myself, and is across from spur to spur.

4859. What area of land would that cover above the dam if the dam were (say) 50 feet in height? Mr. Gipps ought to be able to tell you, as he had a good look at the place; it would run on an average about a mile in width, and it would be about 3 miles long I should say.

4860. And if the water were impounded at that point, it would be at an elevation commanding the whole of the good land between there and Narrabri? Yes.

The Gulf

4861. Do you know of any other places? Yes, there is a much better place called the Gulf. As far as I can judge it is a much larger basin, and the dam would only require to be a few yards, probably 200 to 300 yards, instead of a mile long; I think that the place is well worth examination; water impounded there would also command the lower country; all the water goes down to Bourke.

The Rock.

4862. You are acquainted with a place in the neighbourhood of and above Boggabri, called the Rock? Yes.

4863. Is there a ridge coming down to the river on the southern side? Yes; this ridge is about half a mile below the Rock, known as Biddy-wyndia.

4864. Is there a corresponding ridge of country coming down opposite on the north side? No, I think not; the ridge comes down on the north side, about half a mile below the Rock; the ridges on north and south sides of Namoi, below the Rock, are nearly opposite.

Country about The Rock.

4865. The country in this neighbourhood is flat, and the plains extend out some distance from the river? Not immediately from the Rock; about there it is precipitous. From Gunnedah, where the Mooki joins, to Narrabri, the Namoi is confined; you get small plains, but not of any extent; parts of Burburgate are pretty level, but you can see the mountains or ridges a few miles from the river, all along the same.

4866. Is there a bar of rock at this point? Of no great extent; I only judge from casual observation; it is much similar to that seen by the Commission immediately above Tittamuch Rocky Crossing.

Bar at Broadwater.

4867. Is there any point in the river, from that point downwards, at which rocks can be found? The next bar is at Broadwater; Mr. Gipps inspected this.

4868.

Mr. J. Moseley.

12 May, 1885.

4868. Is that near the Turrawan waterhole? That would be the place; there is a small bar about 3 miles above Narrabri.

4869. Do you think that it would be possible to throw across the river, at any of these bars, weirs which would be likely to stand? You might possibly do what you require by means of overshot dams, but that is a part of the question which is beyond my knowledge.

Overshot dams.

4870. Supposing that the water were thrown back by means of overshot dams, would that tend to divert the channel of the river in any way? I doubt it; the upper current in times of flood is strongest.

4871. Do you think the nature of the banks is such that if the water ran over them at all it would be inclined to make a wash? It would if you confined it about here, but lower down the river I do not think so; lower down we find that the bed is the smallest part of the stream in a flood; the river in floods running out into warrambools, billabongs, &c.

4872. Would the construction of overshot dams at this point have the effect of throwing a reach of water back any distance? I can hardly say, but I should think not of the extent you would require.

Importance of navigation.

4873. Do you consider that the damming of the river, at various points where facilities offered, would be disadvantageous if a railway were run in the vicinity of the river: would you consider the navigation of the river of more importance than the impounding of water under such circumstances? Certainly not; that is if the railway afforded the same facilities and rates of carriage as the river would do.

Utilization of stored waters.

4874. Do you think that if large quantities of water were stored, and placed within reach of persons resident in the district, coming down from the hills by means of gravitation, or from overshot dams on the rivers, that the water would be used to any great extent? We should have to have considerable population; of course it is done in other parts of the world, and I see no reason why it should not be done here; I have seen similar works in California, and I have read of such in Italy; I do not think that it would pay for grazing.

Storage of produce.

4875. But if the squatters had an opportunity to obtain water in this way, do you think they would be likely to grow a large quantity of produce to store for stock in dry seasons? That is a very difficult matter on which to give an opinion; the only way in which you could make them do so would be to carry produce at a higher rate by rail; produce at present being as a rule much more cheaply procured from the Hunter and Paterson, &c., than it can be cultivated hereabouts at remunerative prices to farmers.

4876. Suppose produce were at such a high price in the upper parts of the hilly country that it would not pay to purchase it to feed stock in dry seasons, do you think that under these circumstances the lessees would be inclined to utilize the water and grow produce in reserve? I can hardly say; I know that it has been done. In California a comparative desert with a population of about one man to the square mile has been converted into a place in which there is now a population of two men to the acre.*

Water rate.

4877. Do you think that the farmers or selectors in this district would utilize the water and be prepared to pay a fair rate for it? Farming is now a dead letter; they cannot compete with the down countrymen. If there were a change of season it might be different; now they cannot compete with the Maitland and Clarence men.

The farmers.

4878. Their only opportunity of competition lies in the presence of water? There is no doubt of it; the farmers are now existing—they are not living; they live chiefly by wool-carrying, and by doing a little fencing and shearing now and again.

Crown Lands.

4879. If water were impounded and were available for irrigation, is there any large area of Crown Land open for selection below Narrabri upon which that water would be likely to be utilized? Yes, large areas from Narrabri to the Barwon, and on the other side of the Barwon there is no selection to speak of.

Subdivision of properties.

4880. Do you think that persons possessing large properties would be likely to subdivide them and let the land for farming purposes if there were a good supply of water, and if they found that it was likely to pay them better than keeping the land for the purpose for which it is used at present? No doubt of it; we certainly cannot make 5s. per acre on grazing land now, and of course if we could let the land to farmers at £1 per acre we should be quite prepared to do so.

Wells.

4881. Have you any experience in well-sinking? Not here; I have done a great deal.

4882. In this district? Yes; from here towards Edgeroi and Gurley. The depths are very uncertain; you get water in some places at from 10 to 20 feet, and in other places you cannot get it at 120 feet. The basalt crops up through the ground lower down. On the north side of the river towares Boolcarroll there is a uniform depth; from Gundamine towards Boolcarroll water is obtained at a uniform depth of about 80 feet.

Boolcaroll.

Stratum.

4883. Is that all one stratum then? Evidently so; you go down through ordinary black soil on the plains, then there is a sort of fine sand, after which you reach the river gravel, and when you have taken out a certain amount of gravel you get a rapid flow of water.

4884. Do you put down cylinders? I have never known of cylinders being used.

Source.

4885. Have you any idea of the source of the water? I imagine that it has originally been the bed of this or of some other large river; it is exactly the same gravel as you find in the river bed at the present day.

Area.

4886. What width would that area be? More than 30 miles long, and about 12 wide.

Old watercourse.

4887. Apparently it is an underground watercourse? I should say so.

Supply.

4888. Have you noticed the water flowing in any direction? I have not noticed it. We have drawn for two days and three nights at the rate of about 60 gallons per minute from a well which is 7 feet by 4 feet clear, and of a depth of 70 feet. Of course there was a little loss of time in changing horses in the whim, but we have never been able to decrease the water in that time and at that rate of work.

4889. That would be about 216,000 gallons in the time you have stated? Yes, that would be the amount if the work never ceased and there was no loss of time. I do not suppose that we ever quite drew that quantity. In dry weather sometimes there is a loss of a few inches.

4890. Do you know of any other part of the country in which the same thing occurs? No.

4891. Would it not lead you to suppose that there is a line of water running underground from the Namoi towards the Barwon? That is one theory.

4892. It could not be water from the Barwon to the Namoi? No; not unless the Barwon be a higher level than the Namoi.

Wells on Thalaba Creek.

4893. All the wells on Thalaba Creek are deep, with little or no water? Some selectors named Burrowes have some good wells near the creek; they are very deep, and they are sunk through salt. I have heard of, but have not seen these wells.

4894.

* Note (*on revision*):—This is what is stated in California. I cannot vouch for the figures.—J.M.

Mr. J. Moseley. 12 May, 1885.

4894. Does this water run from the Namoi to Thalaba Creek? I should not think so.

4895. Do the banks erode on one side by the force of the current when the river is running in flood and deposit on the other side? Not to any perceptible extent; little spits are being constantly formed.

Erosion. 4896. You do not remember the course of the stream changing very much? No; the river in the past thirty years has made small deviations in the ana-branches and bights, but not to any very great extent.

Artesian water. 4897. **Is the water artesian in any of the wells of which you have spoken? It does not rise to any great extent; but we have not got to the proper depth; we have only used pick and shovel.**

Trusts. 4898. Do you think that if any system of water conservation and distribution were adopted, the best plan would be to form local Trusts throughout the Colony? I can hardly say.

Silt. 4899. *Mr. Franklin.*] You have not had an opportunity of disturbing silt in the bed of the river in dry seasons? We have had to do it on several occasions; I am doing it at the present time in the creek which runs into the river.

4900. Are you actually doing so in the bed of the river? I have done so to obtain water in former droughts, but not now.

4901. Do you find the water there at a corresponding level to the ridges above and below? I should say probably so, as they have been drunk up by stock to the lower level, so I have had to deepen the well in the bed of the river.

Level. 4902. You think that the level is continuous throughout the river bed? Yes; some beds of clay may throw it higher up here and lower down there. All down the Namoi they have been able to get water in times of extreme drought. In 1838–9 they were always able to get water by digging a certain depth in the river.

Deposits. 4903. Have you observed great changes in the deposit of silt after floods? Yes, there are great changes all along the river; I can show you three-quarters of a mile where the river is dying away.

Water reaches. 4904. Has a long reach of water been known to exist through all changes of season for many years? That at Broadwater is one, and another above Boggabri, known as "Bool."

4905. Have you ever known it to be silted up? No.

Deposits. 4906. Would the large deposits of silt of which you have spoken be in the vicinity of the discharge of creeks from the mountain sides? The one which I spoke of is near the mouth of a sandy creek called Jack's Creek.

Sand. 4907. Do you suppose that the sand is brought in by the creeks from the adjacent mountains? Yes.

Water conservation. 4908. *Mr. Murray.*] As a practical man of long experience in this district, you have come to the conclusion that it is quite practicable to conserve water for the benefit of the whole district? I have no doubt of it.

4909. And that it would increase the productiveness of the place and enhance the value of the country very much? Yes.

4910. And that the people would contribute a fair amount towards the interest on the money expended upon the necessary works? I should think they would; certainly they ought to do so.

4911. *Mr. Franklin.*] Do you know the course of the river from the junction of the Manilla? Yes.

Channel. 4912. If we were to cut a channel down the best course on the northern side, what length would it be? Something over 100 miles I should say.

4913. What is the river course? I can only roughly estimate it at 2 to 1.

Mr. William Pirie called in and examined:—

Mr. W. Pirie. 12 May, 1885.

4914. *President.*] Where do you reside? Tarriaro, about 9 miles from here above Narrabri.

4915. Have you lived here for many years? About twelve.

Irrigation. 4916. Have you adopted any system of irrigation for gardens? I have water laid on for the garden, but it is raised by a small horse-pump.

4917. But you have demonstrated the necessity of having water in that way in order to grow anything? There is no doubt of it.

4918. Did you prepare the land by trenching? For some purposes I trenched it, but for others I did not; I have not trenched it for grapes—they do remarkably well without trenching.

Agricultural land. 4919. Do you think that there is any large extent of land in this district which would be utilized for agriculture if there were plenty of water? There is a great deal of land upon which you could grow almost anything, especially wheat and grapes.

Crops. 4920. One witness whom we have examined said that if he had plenty of water he could grow two crops of potatoes from the same land in the year? If so, he is right. That is done, and it could be done easily if there were plenty of water at command.

The Rock. 4921. Do you know a place called the Rock? Very well.

4922. There is a ridge coming down to the river on the south side? Yes.

4923. Is there any high country on the opposite side? Yes, but considerably lower down—quite a mile.

4924. You are sure that there is a difference of about a mile between the rock on the south side and the high country on the other side? Yes, I believe it is about a mile.

Dam. 4925. And a dam would have to extend the whole distance? Yes; there is nothing which a dam could abut on to nearer than a mile.

4926. Suppose a dam 50 feet high were constructed, would a large quantity of water be backed up there? A very large area.

4927. What width would the water extend over the plains? I should think about ¾ of a mile.

4928. About what distance from the dam would the flat country be opened up? About a mile above the north side.

4929. And it would continue to be opened up on the north side? Yes.

4930. Until it got how wide? For 4 or 5 miles up* (say) it would be 10 or 12 miles wide.

4931. Would a 50-feet dam raise the water up to that point? Scarcely; I think that it would very nearly do so; the general fall of the river there is about 16 feet to the mile.

Fall of river.

4932.

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* NOTE (*on revision*)—Down, I mean to say. I mean that 4 or 5 miles down the river from a dam thrown across at the Rock the flat country would open up to 10 or 12 miles wide on both sides. Above the Rock there is a large area of flat land which could be irrigated, but the water would have to be taken out of the river much higher up.—W.P.

4932. Supposing that a large quantity of water could be stored there, would it command any great extent of land below? Not such a great deal of plain land immediately below. Mr. W. Pirie. 12 May, 1885.
4933. Could the water be drawn off by means of a canal on to a large extent of country? Not without carrying the canal down near to the river for some 3 or 4 miles. Canal.
4934. If the water were drawn below at an elevation by means of a canal, it would command a width of 10 or 12 miles of good land, mostly on the north side? Yes.
4935. Have you any knowledge of the hills at the back of your property? Yes.
4936. Have you noticed any places at which large quantities of water might be stored at the mouths of the creeks? Several places in the Nandewar range. Storage.
4937. Are they worthy of examination by our Engineer? I think so.
4938. Can you give us any accurate description of them? No. Eulah, Bullawaa, Maule's and Bibla Creeks have in certain places to pass through very narrow gorges.
4939. Have you sunk any wells on your station? Yes. Wells.
4940. With what result? Plenty of fresh water.
4941. No artesian water? Some of the water rose 30 to 60 feet. Rise.
4942. Is it drainage from the Nandewar range or from the river? I think from the range; it is an underground supply of water coming down towards the river; we often get it through beds of pebbles set in clay; it is a clay-pan full of water-worn pebbles. Drainage. Underground supply.
4943. Have they been brought down from the hills? I think that they must have been rolled down the mountains and bedded in what must have been at one time a very large basin. I do not think that it is water from the Namoi.
4944. Have you noticed that the river water is lost at any particular point by percolation? Yes. Percolation.
4945. Can you fix any point? There are half a dozen places between here and my place where water disappears and reappears.
4946. It goes below sand? Yes.
4947. Do you know of any place where water goes away from the river altogether, and in which the volume of the river is lessened and does not return? No.
4948. Have you ever tried if there is a current in any of these reaches? I have often sunk small holes in the river, and I have found that the water runs into the bed. Current.
4949. Have you ever noticed in any of the long reaches any floating bodies which would indicate that there was a current? I do not think I ever noticed any.
4950. Is it your impression that the water is flowing down the river? I think that there cannot be any doubt about it.
4951. *Mr. Franklin.*] Are the banks usually above the highest flood known, that is the natural banks? No. Banks.
4952. At the Rock what is the width of the river at the highest flood? I should think about a mile and a quarter on the northern side; opposite, the width would be about half a mile; during high floods there is a large sheet of water 5 miles up the river, about 300 feet wide. There is a sheet of water called Broadwater, extending for about 5 miles on the river, which at high floods extends over the banks to about 2 to 3 miles in width; it is situated about 10 miles above Narrabri; a weir raised above the level of the banks would hold a large supply of water. The width of Broadwater ordinarily is about 300 feet all the way up. Floods. The Broadwater.
4953. Is it your opinion that it would be practicable to throw overshot dams across the river at certain selected points which would be likely to stand? I believe it would, but I think that it would be very costly; I think that in many cases the banks would wash away; the banks are invariably soft on one side and hard on the other. Overshot dams. Banks.
4954. But with judgment in the selection of the sites you think that the work could be carried out? I think it might be done in several places; at Broadwater I suppose that the hole is about 20 feet deep in places, and to raise a dam to the top of the banks you would have to raise a bank about 20 feet higher than the bed—or taking a bar from base of embankment, somewhat less.
4955. Have you ever had occasion to construct any jetty or timber works in the river? I have put up a wattle fence when the river was dry; the posts are still standing—they have been standing for the last seven years. Jetty.
4956. Is there any scour in the banks near them? No, but there is a scour around the roots of trees, especially in cases where trees have fallen and the water gets between them and the banks; in one place, at Tarriaro, the bank has washed away 8 or 10 feet in twelve years; it is about 20 feet deep. Scour.
4957. You have seen large floods? Two or three.
4958. Have you had large deposits of sand on your land? Yes.
4959. On the surface? Yes, it has been left in the bends a great deal. Deposits.

SATURDAY, 16 *MAY*, 1885.

At Walgett.

Present:—

MR. DONKIN, J.P., | MR. FRANKLIN, C.E.,

MR. M'MORDIE, M.I.C.E.

F. A. FRANKLIN, ESQ., C.E., IN THE CHAIR.

Mr. Frederick York Wolseley called in and examined:—

4960. *Chairman.*] You are a run-holder in this district? Yes; I have Euroka. Mr. F. Y. Wolseley.
4961. How is that situated with regard to Walgett? The run commences four and a quarter miles below Walgett on the south side of the Barwon River; it is in the county of Leichhardt.
4962. I suppose you are well acquainted with the district generally? Fairly; not with the outlying portions to any great extent. 16 May, 1885.
4963. What is the state of the Barwon at the present time? It is flowing slowly. The Barwon.
4964. And in its course is the water continuous, or is it interrupted by silt? It is continuous.
4965. It is a continuous stream? From here to Brewarrina; there it is interrupted by rocks.
4966. And I suppose you consider this a very dry season? Yes.

Mr. F. Y. Wolseley. 16 May, 1885.

4967. Have you ever known the Barwon to be completely dry? Never.
4968. How many years have you been resident here? Nine years.
4969. I suppose you consider the present time is the continuation of an unusual drought? Yes, almost unprecedented.

Loss of stock.

4970. And there has been a very considerable loss of stock throughout the district? The losses have been very numerous.
4971. Could you roughly estimate the extent of the loss with regard to the total stocking of any portion of the country within a considerable radius of this place—taking (say) a radius of 100 miles from Walgett? I should think 60 per cent.
4972. Could you give in an approximate estimate of the quantity of stock in that area? No, I could not. Some stations I may say have lost all, some one-half, and some have lost comparatively few.

Causes.

4973. I suppose the majority of losses were occasioned entirely by the want of feed? Yes.
4974. In no measure from the want of water? Not to my knowledge. Of course want of water has had a great deal to do with it. Had there been more water probably the losses would have been less, because many of the stock died from bogging, owing to the lowness of the water.
4975. In estimating the quantity of stock within a radius of 100 miles you necessarily go beyond the distance from which you could bring stock to the river—you could not bring stock 100 miles to water? Of course not.

Creeks.

4976. Then are there any creeks between Walgett as a centre and that radius of 100 miles in which there is a constant supply of water? No creeks or rivers except the Barwon are constant in their stream.
4977. And how do you manage to water stock at the outer part of the radius? By conserving water in tanks.

Dams.

4978. Do you know if any effort has been made to store water in dams along the creeks which are running from the river? Very few efforts to my knowledge, because of the uncertainty of tenure.

Reservoirs.

4979. What would be the result if you were to make large reservoirs for the storage of water in the creeks? By conserving water liberally, the general management of stock would be materially assisted.
4980. What would be the result to the runholders if they were to make large reservoirs of water between the rivers so that the flood-waters could be impounded? The stock could be kept generally in better condition, and naturally there would be more wool.

Uncertainty of tenure.

4981. Then why is it that a more general effort has not been made to conserve water in that manner? On account of the uncertainty of tenure—the want of security to the runholder who would incur the expense of making the provision. There is no guarantee, no protection of any kind to the person who incurs the outlay. He may spend his capital freely in endeavours to store water, and shortly afterwards find his efforts frustrated by another depriving him of the benefit he had hoped to obtain.

Reserves.

4982. If he were protected by a reserve for a considerable area in the neighbourhood of these improvements, would he be induced to do more than has been done in the way of water conservation? Very much more.
4983. Could you give me any idea upon what terms such reserves for your protection could be established? I should say that, in the case of dams, were the land on both sides of any creek—say to the extent of 2 miles back—protected to the lessee, he then would be prepared to invest largely in the construction of dams for the conservation of water.

Stock-routes.

4984. And as that reserve would in many cases cross runs, would there be any objection to make the stock-routes along that water-line? Certainly.
4985. What would be the objection? It would deprive the lessee of the run entirely of the advantage of the water; it would, in fact, be opening the run to the general public.
4986. So that the advantages of the water to you would be entirely nullified? Entirely.

Depressions.

4987. Do you know of any tributaries to the Barwon and Namoi where there are large depressions in which water might be stored? There are very many such, and water could be stored largely if the lessee had any security for his investment.

Cost of water conservation.

4988. Taking an ordinary run in this part of the country, what would be the cost of water conservation in proportion to the general expenses of station management? You cannot calculate it annually, because before you stock country you must conserve the water, and that conservation must depend on the quality of the country. There is afterwards the annual expenditure to keep the tanks in repair.
4989. What proportion would the expenses bear to the other expenses of securing the property by fencing and other improvements? Conservation of water would be the greatest expense.

Water rate.

4990. Supposing a system of constant water supply to pastoral tenants could be established at a moderate cost, would there be any objection on the part of runholders to pay for that constant supply? None, if the water were conserved in such a way that it would not interfere with the rights of the lessee; the lessee would then be perfectly willing, as far as my experience goes. I am personally inclined to pay a portion of the expenses, of the interest, on any money which may be expended in the conservation of water.
4991. You are of opinion that if water could be conveyed through this dry country, and placed under Trusts or some other means of local supervision which might be devised, the lessees would not object to pay a fair interest on the outlay? I think not, always provided that they knew beforehand that they would be secured on the leasehold of the runs. At the present time there is really no security. Now you may invest private capital in developing the resources of the country to the extent of thousands of pounds, and you have no guarantee that you will be able to call the improvements your own.

Security of tenure.

4992. From that I infer that under a more secure tenure you would use still greater exertions to avoid the disastrous effects of these great droughts? I have no doubt in my own mind that if protection were afforded, the money expended in the conservation of water could be increased 300 or 400 per cent.
4993. What system do you now adopt for watering your run? It is watered on the front by the Barwon River, and on the back by tanks.

Tanks.

4994. How do you construct tanks in this flat country in order to obtain a sufficient watershed for their supply? I have excavated them at the edges of the few natural rises or low salt-bush ridges.
4995. Do you adopt any system of survey before you fix a site for a tank? No; I simply fix the tank where I know the water will run off the ridges, and by means of drains from the small ridges I convey the water into the tanks.

Capacity.

4996. What is the ordinary capacity of your tanks? From 4,000 to 10,000 yards.

4997. In what shape? Square; I mean, of course, that the excavation would be square.
4998. Are your tanks sunk under contract? Always.
4999. And they are constructed to your satisfaction? Yes.
5000. In specifying for the construction of tanks, do you specify that the slope shall be perfect—that the angles shall be taken out accurately? It is not absolutely necessary.
5001. Would that increase the cost? Yes, it would be greatly increased if you made the work so very accurate; we do not consider it necessary.
5002. How is the earth excavated? Generally by plough and scoop and pick and shovel. Some adopt one system, some others; it is entirely within the choice of the contractor. (*Appendix* W.)
5003. What is the batter of the sides, excepting the slope for the watering of the cattle? Tanks are generally constructed with a batter of from 3 to 5 to 1, with 6 to 1 for the roadway; thus stock can water all round. I do not approve of stock watering at tanks at all; that is to say, I do not approve of their going direct to the tank.
5004. Have you adopted any measure which you have found to be superior? Yes, I have; it is only when the stock water at the tanks that I make the batter 5 to 1.
5005. You pump from the tanks? Yes.
5006. In pumping from the tanks, what manner of distribution do you use? I have raised tanks 6 feet above the surface of the ground.
5007. And in so doing you have adopted the general system of the district? Yes.
5008. How is that tank constructed? With wood, lined with sheet-iron.
5009. And you distribute the water from this tank into troughs? Yes, by means of a ball and valve.
5010. That system of tanks requires constant supervision? Yes, to keep the supply tanks full.
5011. So that the cost of the supervision is added to what you say is the proportionate expenditure on the run for water conservation? Yes.
5012. If a system of constant supply could be established, it would very much reduce your general expenditure on the whole of the run for a period of ten years, and you think it would receive your support? Certainly.
5013. You know the Government tanks? I have seen them.
5014. The description you have given of a tank on a small scale is much like the system adopted by the Government? Something similar, but their arrangements are more elaborate and better.
5015. And in as many cases as you have seen you consider them satisfactory? Yes.
5016. And you do not know of any other method which has been applied in this district and which you consider more practicable? None, except as I before stated, by the construction of dams, were security afforded for the outlay.
5017. Do you apply any of the water which you now conserve to agriculture? None.
5018. If you had abundance of water, would it be worth your while to cultivate paddocks if you could convey the water by gravitation? If I had security of tenure it might.
5019. If you could command an area of (say) 200 or 300 acres, would the soil be suited to agriculture? It would grow anything suitable to the climate.
5020. Supposing you had an abundance of water, and this water could be made to produce feed for your cattle, would you be inclined to cultivate a large area in order to store feed against bad seasons? No; because the expense of cultivating crops to keep your cattle alive would more than equal if it would not exceed the value of the stock in the course of a very few months.
5021. Is that the general impression? I believe it is.
5022. You are aware that it is practicable and that it has been proved that cattle can be saved by feed stored in that way? I do not think it is done in this district. I have no doubt that it can be done on a small scale, and that you could keep a small number of cattle alive; but in this district the runs are nearly all stocked with sheep—there are very few cattle; and in speaking of the production of artificial grasses I must be understood to refer to sheep—not to cattle. The quantity required to protect yourself against drought in order to save your stock would be too great.
5023. I am not speaking so much of artificial grasses as of the growth of cereals and hay? That would be the same; the expense of producing the hay would be greater than the value of the stock, even if you had to keep them alive for twelve months, unless of course you applied it to a limited number of selected sheep.
5024. Supposing it were not possible to grow sufficient fodder for all your stock, would not a certain supply tide you over the most disastrous period of a drought? I do not think it would pay under any circumstances. I do not know of any principle upon which you could produce the fodder so that it would pay, if you had a sufficient quantity of water.
5025. The labour would cost more than the absolute loss of stock, of which you have already spoken in your evidence? Yes; I think the effort to keep the stock alive would cost more than they were worth. It would be economy to lose your stock in preference to going to the expense of raising fodder to keep them alive.
5026. Can you give the Commission any idea of an arrangement which would secure you against the effects of these droughts? No; you cannot fight against the freaks of Nature. The only preventive in the case of emergency, I should say, would lie in the extra conservation of water. I know of no principle upon which you can profitably produce fodder for stock.
5027. Has any attempt been made to hold back the waters of the Namoi River by means of dams? Not that I know of.
5028. Not in a small way? No.
5029. So that you do not know what the result of that would be? I know of small dams which have been erected when the river had almost ceased to flow, but they were only temporary dams.
5030. Was the flow apparent? Yes.
5031. What was the height? 4 feet.
5032. How were the dams constructed? With plain earthwork.
5033. And it was expected that they would be carried away at the time of a fresh? Yes.
5034. What was the result? The water backed up behind the dams. I know of one dam where the water backed up 4 miles.
5035. How is that water made available for stock or other purposes? It was not brought to the surface—the stock were watered at the edge of the water.

Mr. F. Y. Wolseley.
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Excavation.
Batters.
Pumping.
Construction.
Distribution.
Supervision.
Cost.
Government tanks.
Cultivation.
Expense.
Stored feed.
Value of hay and stock.
Protection against effects of drought.
Dams on Namoi.
Flow.
Results.

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5036. In a small way it proved practicable for the retention of water on the banks of the river? Yes. There is no doubt that dams could be constructed and would be constructed on a very large scale if the lessee were protected in the expense he might incur.

5037. Have you seen the Namoi and Barwon in flood? Yes.

Floods.

5038. Have you any idea of the velocity of the stream in flood-time? About 5 miles an hour.

Velocity.

5039. That is in the centre of the current? Yes.

Width.

5040. What is the average width at high flood? In a very high flood it extends from the Barwon to the Castlereagh. In 1876 it extended, to my knowledge, 10 miles back from the Barwon.

Discharge.

5041. In your opinion, the whole of the water discharged passed Bourke to the Darling? I should think so, as all the minor rivers and creeks eventually empty their waters into the Darling.

5042. For how long a period does that extent of water remain on the country? The country is so flat that in the year 1880 the water remained for one month stagnant.

5043. Over the whole surface of the country? No, only over some flat-lying strips.

Waterholes.

5044. And when it subsided into the creeks were they flooded for any length of time? No; because the creeks gradually flow out into the river—the creeks become chains of waterholes.

Locks.

5045. No effort or suggestion had been made to lock the entrance of these creeks so as to hold the water? None that I know of.

5046. Would it not be an advantage to you to have the creeks constantly charged? Yes. Private enterprise would do all that is necessary if we had security of tenure.

5047. As far as you know this radius of 100 miles, do you think it would be possible to lock the flood-waters in these watercourses and billabongs? Decidedly.

5048. Under a proper tenure, if such a work were suggested, there would be no objection to pay for the advantages derived from such a storage of water? None.

Wells.

5049. Have you done much in the way of water supply by wells? I have tried on my run thirteen bores. I used Pierce's machine.

Depth.

5050. What was the result of those bores? I found water at depths varying from 40 to 68 feet.

Supply.

5051. In any quantity? Apparently a large supply.

Quantity.

5052. What was the nature of the water? In every instance the water was brackish. I had the water analyzed by a chemist in Sydney, and the analysis proved that the water contained more salt in solution than the sea does. It was unfit for stock, as being of a poisonous nature.

Earth.

5053. Did you send samples of the earth at the level at which you found the water? No, I only sent the water.

5054. Then the earth has not been analyzed? No. I know that it contains a very large proportion of soda—it is visible to the naked eye.

Supply.

5055. Did you attempt to go below that level? No. The supply of water was very great, and it rose in the bore.

Artesian.

5056. It was artesian? To a certain extent. It rose 15 feet—I found it in coarse drift.

Country.

5057. What was the nature of the country where these bores were made? All flat, black-soil country.

Test bores.

5058. In making those test bores, did you go any great distance apart to get away from the basin of salt? I separated them by 5, 10, and 13 miles. I tried in every eligible spot, and in every case I met with the same result. Eventually I gave it up in despair.

Expense.

5059. I suppose you have made a large expenditure on these test bores? Yes, very large.

5060. Do you know of any one in your neighbourhood who has been more successful in sinking for water? I do not.

5061. At what distance would you say from your run, taking a certain radius, have they failed to get water by means of wells? I know they tried at Wingadee, and with similar results.

Depth.

5062. You have not heard of their having gone to greater depths, going through the salt water and afterwards striking fresh water? Not in this immediate neighbourhood. I have heard of wells being sunk 200 feet with results similar to my own.

5063. In this neighbourhood? Yes.

Surface water.

5064. Altogether you think that the surface water is to be depended on in the vicinity of Walgett? That is my experience.

5065. The water does suffer from saline matter on the surface? It does to some extent. When tanks get low the water becomes brackish to a certain degree, but not in any way to injure it.

Evaporation.

5066. Have you remarked the proportion of evaporation in regard to consumption in your tanks? I have never made any calculations, but I may say that the evaporation in the exposed tanks is very great in windy weather.

Tanks.

5067. Did you arrange the materials taken from the tanks in such a manner as to protect the water from these strong winds? Not with the object of protecting the tanks. I generally bank the earth around the tanks, and that in a great measure does protect them.

Wind.

5068. Is it a prevailing or a chance wind? A chance wind.

5069. Not more from the west than from any other quarter? No. I do not think the evaporation is directly caused by the wind; it is by the absorption and constant evaporation from the soil, owing to the wind blowing the water on to the slope.

Plants.

5070. You never made any attempt to plant round the tanks, to prevent absorption by windage? No; the plants would absorb more water than would compensate for the advantage which you would gain from their being there.

Suggestions on water conservation.

5071. Could you give us any general information or make any suggestion which you think would be of service to the Commission? The only suggestion I would make would be this,—that if greater protection were afforded to the capitalist a very much larger amount of money would be invested in the conservation of water. I believe that private enterprise would then benefit the district immensely. Under the existing tenure of our runs we have no protection; therefore we merely conserve that water which is sufficient for the day.

5072. *Mr. M'Mordie.*] You say that if water frontages extending 2 miles back from the creeks were granted to the runholders, works of water conservation would be carried out by them? Yes.

5073. But would not that give them a monopoly of the land in such places, and tend to prevent settlement in the neighbourhood? That is a question I cannot consider; I merely answer the question put to me as to how it would be possible for water to be generally conserved for the benefit of the runholder; if they were called on to conserve water they would naturally expect some protection.

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5074. Are you aware that in some districts of the Colony crops are grown by means of irrigation, and that these crops are the means of saving large numbers of sheep and other live stock in time of drought? I never heard of one instance.

Irrigation.

5075. Are you aware that some very large runholders have purchased great quantities of hay for the feed of stock at critical times, at prices far beyond the cost of growing it by means of irrigation? I heard of their doing that in the Murrumbidgee district to save their stud sheep, but I do not think it has been done in this district.

Farming

5076. When water is available for pumping, what would be the cost of growing wheat by means of irrigation? I know nothing of agricultural farming, but I should imagine that farming could be conducted by these artificial means only on a very limited scale; it takes a very large quantity of water to irrigate this soil; it is very porous and very deep, and in almost every place it would take a very large volume of water.

Well at Goodooga.

5077. *Mr. Donkin.*] You say you do not know of any payable wells being sunk in the district within 100 miles: do you know that the Government has struck water at Goodooga, and that the bore produced 48,000 gallons per day? I am not aware of that.

5078. Goodooga, I believe, is 100 miles from here? About that.

5079. Is it the same sort of country? Similar country.

5080. According to Mr. Henderson's report it is an inexhaustible supply? I have not heard of it.

Sheep and cattle stations.

5081. You said that nearly all the stations about here were sheep stations: are there no cattle stations left in the district? I do not know of any in the immediate neighbourhood.

5082. Can you assign any reason for it? Only that sheep are more profitable.

5083. And do sheep stand the drought better? Yes; they can live on scantier herbage.

5084. I think you have had experience in the Riverina? Yes.

Wells in Riverina.

5085. Did you find some difficulty there in consequence of chemical matter in the water? No; wherever I sank wells in the Riverina I have found water suitable for stock, that is between the Murray and the Edward Rivers.

5086. Have you had experience in Queensland? Lately.

Water in Queensland.

5087. Is there the same difficulty in obtaining water there? The difficulties are greater there, because rock is encountered at from 2 to 5 feet from the surface; that is between the Warrego and the Nebine Creeks.

Supply.

5088. Did you obtain water for stock? Not enough for stock purposes; the supply at the shallow depth —40 feet—was limited; that gave me the belief that the water was not a spring but a soakage; I believe that water would be obtained by sinking deeper; the first indications were certainly sufficient to warrant such deeper sinking.

5089. How far from the Barwon would that be? About 300 miles.

Fodder growing.

5090. I understood you to say that you do not think it would be a commercial success to grow fodder for feeding stock in the time of drought? I do not.

5091. What do you consider the average return per sheep per annum? That depends very much on the season.

Return from sheep.

5092. Supposing you could keep them on artificial feed in times of drought, what return would you look for? I should be satisfied with from 4s. to 5s. per head.

5093. Did you get that this season? No; there was a loss of about 10s., I should think.

Well-boring Hand labour.

5094. You spoke of your using Pierce's well-borer: did you employ hand labour or horse-power?

Tubing

5095. You have not tried tubing in the wells which you have put down? No.

5096. Do you know that Pierce's Company say that it is absolutely essential to tube the wells in order to obtain water? I came on to drift in every instance; I had no tubes, therefore I could not go through it.

5097. Do you know that Mr. Darley, in his report upon wells in America, specially points out that the secret of obtaining water in most wells consists in the use of tubes? It may be so; I have not tried it. The expense would be rather too great for trials. Here the country has not been tested, so you would not know to what depth it would be necessary to obtain tubes for; the expense would be too great.

5098. You have no means of carriage here except by teams? No; it is by teams.

5099. Do you get water carriage to Walgett? The river has not been navigable since 1876.

5100. Do you know that on some of the runs on the Darling they have bored to a depth of 700 feet? I have heard so.

Evaporation.

5101. Speaking of evaporation—do you think anything could be done to protect the water from the wind? Yes.

Floating stage.

5102. By growing water-lilies or weed? Yes, that could be done. My idea of protection is to have a floating stage or cover at the top of the tank. Of course that means expense where you have not timber close at hand. If I had plenty of timber I would have had covers to every tank; unfortunately we have only a limited supply; there is no pine within 30 miles of my place.

New Land Act.

5103. You think that under the new Land Act, giving security of tenure over a large portion of land will increase the amount of works carried on by the lessees? To a very large extent.

5104. Do the lessees employ any large amount of labour now? No; all work is at a stand-still.

5105. How do you raise the water into the tanks? By a M'Comas' pump.

Water-raising windmill.

5106. Would not a windmill answer the purpose? Not unless large overground supply tanks were constructed. The wind is very uncertain; thus it would be necessary to have at least three days' water supply on hand to feed the troughs, otherwise the stock must fare badly; in fact it would be madness to depend entirely on the wind as a motive power for pumping water.

Namoi and Barwon flood waters.

5107. Do you think that conserving a great body of water which passes down the Namoi and the Barwon in flood is only a matter of expenditure? I think it would be quite possible to do it if we had the money.

Tanks and vegetation.

5108. *Chairman.*] Do you find that in watering stock about the tanks the water produces vegetation in the vicinity of the tanks? I have never tried the experiment. The water in the tanks is of course pure water—it is rain water.

5109. In case of leakage from tanks does the vegetation spring rapidly? The tanks are beneath the surface; the treading of stock would prevent the growth of vegetation.

Silt tank.

5110. In constructing your tanks what provision do you make for silt that may be carried down by the supply course? I construct a silt tank to receive the water conveyed by drain from the rising ground.

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5111. In what way do you discharge the water into the tanks? By flume.
5112. Your tanks have been long enough in existence to determine the loss per year absolutely? I have one tank which was 18 feet; now it is only 2 feet deep.
5113. In what time is that? Five years.

Removing silt.

5114. Have you any ready means of removing silt from the tanks? No; it is my experience of removing silt that it is less expensive to construct a new tank. I have proved that in the last twelve months. I had an old tank cleared out, and it cost me more to clean it out than to make a new one.
5115. *Mr. M'Mordie.*] What means did you employ for cleaning out the old tank? Carts and shovels. I let the work by contract, and had to give the men 1s. 6d. per cubic yard; whereas I could get a new tank constructed at 1s. 2d. or 1s. 3d. per yard.
5116. Some system of taking silt from tanks quickly is a general want? It is a want which is very much felt.
5117. Has any system been suggested and carried out? I know of a system which is being carried out at the present time on the Haddon Rigs station.
5118. Could we get the result? I should think so if you communicated with Mr. Greaves, the manager of the station. I think the system adopted there is a very good one, but it requires alteration to make it perfect.

Cost of artificial feed.

5119. *Chairman.*] Can you think of any other information which would be of value to the Commission? With reference to the artificial feeding of stock, in the case of severe drought: supposing it were possible to irrigate the country and to procure artificial feed, I estimate that the cost of the feed for (say) 10,000 sheep, artificially fed for three months at a very low rate, would be £320 more than the actual value of the sheep.
5120. *Mr. M'Mordie.*] How do you arrive at the cost of the feed? I put it down at £4 a ton; I estimate that each sheep would eat 4 lb. weight of fodder daily—equal to 40,000 lbs., or about 18 tons, which, valued at £4 per ton, gives a sum of £72, the daily cost of feeding the 10,000 sheep.
5121. How many tons would you get off 1 acre of a good crop? I suppose something like 4 tons would be a good crop.
5122. And the cost of that would be £16? Yes; it cannot be produced in this district for less than £4 a ton. Bush hay costs £3 a ton.
5123. *Mr. Donkin.*] You think that, taking into consideration the labour of cultivating and cutting hay, it could not be produced here for less than £4 a ton? Yes; and you have to bear in mind that hay cannot be produced without irrigation.
5124. With plenty of water here, as well as on the Murray and Murrumbidgee, if the cultivation of hay had paid, would they not have tried it? They have tried it in some instances on the Murrumbidgee, but on a very limited scale, and only for the purpose of feeding a few stud sheep.
5125. *Chairman.*] What is the duration of the crop before it is reaped for hay? I have so very little knowledge of farming that I can scarcely say.
5126. If you could grow two crops of cereals per annum for hay, would that pay? If fodder could be delivered on the stations at 30s. per ton it might pay to artificially feed stock for four months. If stock were artificially fed beyond that period, I believe they would soon cost more than they were worth per head. In making this calculation, I have taken into consideration the labour necessary for feeding and tending the stock.

Irrigation.

5127. What could you afford to pay the Government for irrigating your land per acre, so as to produce a good crop? The question is so very wide that it would be almost impossible to answer it. It is impossible that they could irrigate the country to any great extent. They could not irrigate to such an extent as to produce a remunerative crop—that could be done only by a flood.
5128. *Mr. M'Mordie.*] But you go further, and say that it would not pay to provide the crops even if the water were provided for nothing? Yes.
5129. And people do so by pumping the water? I may qualify my answer by saying that if you could get the country thoroughly irrigated so as to grow lucerne the sheep would eat it; there would be no need to crop it, and then it would pay; but it would not pay to grow cereals.
5130. *Chairman.*] But taking lucerne for cutting, Mr. Wills-Allen gets 10 tons per acre per annum—would that pay? Under those circumstances I think it would; but I am taking it for granted that there is no expense for irrigation. Lucerne would pay if the water were provided for nothing.

Price of hay.

5131. *Mr. Donkin.*] Can farmers here get £4 per ton for all the hay they grow? Certainly. I do not know of any hay or chaff being bought in this district under £6. Of course it has been an extremely dry season, and there has been a great demand for fodder.
5132. But could not sheep do upon less than 4 lbs. of hay per day? Possibly they might; I do not think so. On the Murrumbidgee, where they fed stud sheep artificially, when the drought was over they found that the sheep had cost in their feed more than double their value; but they were of a special value to the owner, because he could not replace them.

Mr. Charles Norman called in and examined:—

Mr. C. Norman. 16 May, 1885.

5133. *Chairman.*] You are the proprietor of the *Walgett News*? Yes.
5134. Have you been long resident in this district? About five years.
5135. During the whole of that time you have been suffering from the drought? Yes.
5136. In this period have you had an opportunity of seeing the nature of the country over a large area? Yes.

Country.

5137. To what extent did your observations extend from Walgett? Up as far as Mogul and Narran.

Loss of stock.

5138. You know that there has been a great loss of stock in this district? Yes; I am a stock agent. I have sold large numbers of stock in this neighbourhood.
5139. Your business, then, would bring you into close relations with the stock-owners? Yes. I was connected with squatting in the Riverina for eight or nine years before I came here.
5140. In your movements here, then, your observations have been based on your former knowledge? Yes.
5141. To what extent has the loss of stock gone during the last five years? I could scarcely say; it is a very large quantity. I dare say, taking all the runs in this district into consideration, we have lost about 60 per cent.

5142.

Mr. C. Norman.

16 May, 1885.

5142. This loss arose in a great measure from the extremely dry weather? Yes, entirely from the severe drought.

5143. You think that no portion of the loss arose from over-stocking? In some cases possibly it did. I know many runs which were not over-stocked on which the loss has been very heavy. In the third year of the drought the land was absolutely denuded of vegetation. The country here cuts up more in a drought than in any part of Riverina that I have been in. Over-stocking.

5144. Is the present condition of the country better than it was at the time when that great loss took place? Yes, it is a great deal better now. Present condition.

5145. Do you think from its present condition that the squatters would feel justified in commencing to stock again to anything the same extent as before? I do not think so. The rainfall this year is not sufficient to warrant the squatters in stocking up. If there was the same rainfall next year, I do not think the squatters would stock their runs to anything like the extent at which they had them stocked in former years.

5146. Do you know the general system of water conservation throughout the large runs in this district? Yes; it is very simple. Water conservation.

5147. What is the most perfect of which you know? The only means adopted in this district consists of a system of tanks. Tanks.

5148. You heard the evidence as to tanks? Yes.

5149. Do you know of any system better than that which has been described? No.

5150. In your opinion, could it be improved upon so as to ensure a better and a more constant supply? I do not think so under ordinary circumstances. Of course if water could be brought into the tanks by any means from the rivers, or from wells, it would be a better means of keeping the tanks supplied. I know of several runs near Moree where the tanks are kept supplied by steam-pumping from the Gwydir. At Midkin several large tanks are kept supplied by pumping. Pumping at Midkin.

5151. At what distance from the river are those tanks? One is 8 miles from the river.

5152. How is the water conveyed from the pumping station to those tanks? It is pumped into a canal or drain; the water runs right into the tank.

5153. Has a level been ascertained by survey? I do not know what system is adopted. The water is obtained from the river, at a place called Muckabundi.

5154. From your own knowledge and from what you have heard, do you consider that a large proportion of stock is lost absolutely from the want of water? Not from the want of water alone, but from the want of water indirectly, because the want of water naturally causes a want of grass. I do not think that many stock lost in this district perished from the want of water, because most of the runs have frontages and can obtain water. Causes of loss of stock.

5155. I observe that the distance between the rivers is very great, and that the intermediate creeks are now completely dry: I should like to know how the stock without tanks can be maintained over this large district of the Jamison and Benarba? The whole of the stock between the Namoi and the Gwydir could be provided for by tanks and wells. At a point about 30 miles from here, just below Thalaba Creek, the river is stony. I think that if a dam were formed there the water would be sent up into the creek behind it. Thalaba Creek.

5156. What is the nature of the ground? I do not know, except that the river is stony.

5157. What is the nature of the country in the county of Finch to the north-west? The country is not I believe of very great value. Country.

5158. Are there no creeks in that large area? There is not a creek from Gundabloui to Walgett. Creeks.

5159. You know the county of Finch—is it closely settled? There is no settlement at all. Settlement on the river is impossible; the land is of such a porous nature that the smallest agricultural settler would starve. Settlement.

5160. Between the Barwon River and the Narran there is very little settlement for pastoral purposes at present? Very little.

5161. Could the land be improved by irrigation? Yes. Irrigation.

5162. And the nature of the country would permit of the upper waters of the Barwon being carried through it? I think it would.

5163. Considering that the question of water supply to station property is one of the largest expenses, if a constant supply could be laid on through this country, do you think that the squatters would pay a fair proportionate charge for the use of the water? I think that if a good system of land tenure were adopted—if they were certain to hold—they would undoubtedly do so. Water rate.

5164. Do you think that under these conditions they would have more expensive works for their own safety? Yes, under favourable conditions.

5165. In damming the water of the Barwon, to what extent would a moderate dam throw the water back? A dam raised near Walgett would throw the water back as far as Goagra. That is nearly 40 miles by water, but only 18 miles by road. Dam on Barwon.

5166. The dam would produce that result? I think a dam to the height of the river bank would do that. My reason for saying so is my observation of the river in flood-time.

5167. You know nothing of the levels? No.

5168. What is about the average width of that part of the river, and the depth from the top of the bank? I do not know. Width.

5169. Assuming the width to be 100 feet here, what would be the general averarge backwards? I think it is pretty nearly the same width.

5170. What is the depth? I suppose the depth is about 20 or 30 feet. The fall of the river is very small indeed midway between Walgett and Goagra. I have seen the water flowing up the creek towards Castlereagh. Depth. Fall.

5171. Does it return to the river at that point? It goes into a swamp near Castlereagh—Nagal Swamp. Nagal Swamp.

5172. Then it traverses a distance of about 20 miles? Yes; there has been no water in the swamp during the last three years.

5173. Having stored a large area of water in the vicinity of Walgett, in what way could it be made available for distribution except in the watercourse you have pointed out—would it command the country north and north-east of the Barwon? It would only command the country along the banks, unless canals were cut. Distribution.

Mr. C. Norman. 16 May, 1885.

5174. Are not the banks of the river higher than the country further back? I think the immediate banks are.

5175. In what proportion? I cannot say. From crossing the river often, my impression is that they are slightly higher.

5176. You do not know that by making a deep cut the water would flow to the level country behind? I do not.

Canals. 5177. Have you thought of any means by which if the river were dammed at this point the water could be used, except in the immediate vicinity of the river—do you not think it could be made a supply for the lower part of the Barwon towards the Darling? I have thought that canals might be constructed to water the country on each side in the counties of Denham and Finch.

Agriculture. 5178. Do you think that if we could establish a permanent water supply in the county of Finch, any portion of the water frontage could be used for agricultural purposes? Decidedly not.

5179. Why? I think I said before that the country on the river is of such a porous nature that even in the best of seasons it will not grow grass.

Soil. 5180. What is the nature of the soil? It is black soil. I have not enough knowledge of the soil to form an opinion as to why it does not grow grass. There is another place on the river Barwon, 8 miles

Dam. below Walgett, where a dam could be constructed.

5181. Would that be above Wansara ana-branch? It is above it.

5182. And you lose the opportunity of distributing when you get above it? Yes.

5183. Why could you not go lower down for your dam? At the point I have named it is rocky. I do not know that you will get a good site elsewhere in that quarter.

5184. If a dam were placed there, and if water were raised to the height of the present bank, could it be distributed? Only by canals; I think a dam there would throw back both rivers, together with the waters of the Pagan, the Thalaba, and the Pian.

Benefits. 5185. If we conserve water there by a well devised plan, would it be beneficial to the whole district? Yes, very largely.

Irrigation. 5186. *Mr. M'Mordie.*] Do you know of any irrigation carried on at Moree by means of pumping? I only know the pumping which I have mentioned before.

5187. But do they not grow crops by irrigation? No; as far as I know, the pumping is merely used for the filling of tanks.

Dam. 5188. You spoke of a site near Walgett as being suitable for a dam? Yes.

5189. What description of dam would you place there? It would have to be an overshot dam.

Mr. James Rowland Doyle called in and examined:—

Mr. J. R. Doyle. 16 May, 1885.

5190. *Chairman.*] You are Inspector of Stock in this district? Yes.

5191. How far does your district extend? To the Queensland border on the north; on the eastern side to Combogoland; on the western side to the Bogan; to the south-east as far as Goangra.

5192. You are acquainted with all the country in Benarba and a portion of Narran? Yes.

5193. How long have you been in the district? I came to Walgett in 1857.

5194. How long have you been in your present position? Nearly five years.

5195. Prior to taking this appointment how were you engaged? I was on the Ulumbi Station for many years.

Seasons. 5196. During all that time you have seen great changes of seasons—extreme droughts and moderately good seasons? Yes, but I have not kept an account of dates.

5197. The present drought is about the longest you have known? I think the drought in 1868–9 was

Stock. quite as severe, and told quite as heavily on the stock-owners in proportion to the number of stock they had; there was not the same number of stock in the district then as we have had since.

5198. At the time when you had really good seasons there were fewer stock? Much fewer; they were nearly all cattle stations then; now they are sheep stations.

5199. During the good seasons there was little to complain of as to grass and water? No, it is a splendid growing country when we get sufficient rain.

Sufficient rain. 5200. What do you consider sufficient rain? I have not kept a register; in a fair season we should have about 20 inches; we could not do very well with less.

Creeks. 5201. With 20 inches of rain would the creeks in the country between the Namoi and the Gwydir be well charged with water in the summer? We have no creeks extending any distance back.

5202. Do you know the present condition of the Pian Creek? It is very low, and has been for a very long time.

5203. Through how many properties do the Pagan, the Pian, and the Thalaba Creeks run? Between Wee Waa and Walgett, I fancy about ten.

5204. At the present time none of those lessees benefit by the watercourses? A heavy thunder-storm will furnish them with three months' supply in the best waterholes.

5205. The holes hold the water? For a considerable time.

Flood-waters. 5206. Do you think that the water, in times of freshes or floods, could not be conserved, or are there

Dam. soakages? An immense dam was swept away in 1864.

5207. How was it constructed? Entirely of earth.

5208. Was any provision made by means of a by-wash? It was too near the dam, and did not take sufficient sweep.

5209. Do you think a dam would stand if more suitably constructed? I do.

Series of dams. 5210. And would a series of dams in the Pian Creek be of service to the various runholders? Yes, they would give almost a constant supply.

Water conservation. 5211. I suppose you know that the runholders have gone to great expense in conserving water? Up to the last twelve months the system of tank construction had improved very much, but latterly work has been at a stand-still.

Insecurity of tenure. 5212. Do you know of any reason why the squatters should not extend that work so as to be perfectly safe under all conditions of drought? The reason assigned to me is the insecurity of their tenure. If they made large tanks a lot of selectors might come round them. One of the best runs here was ruined the

Capacity of tanks. other day by selection, after the holder had paid £80,000 for it. They have enlarged the carrying capacity of

of the tanks from 2,000 to 5,000 yards to 10,000, 12,000, and 15,000 yards; the small tanks were found to be dry when the lessee wanted water. I think that a tank of 10,000 yards capacity will stand longer with pumping than a tank of 20,000 yards capacity to which the sheep are allowed to go direct; they carry a lot of silt into it, and a lot of water out of it in their fleeces. In addition to saving silt from being carried into the tank, by means of a pump the last gallon of water could be utilized. Mr. J. R. Doyle. 16 May, 1885.

5213. Have you observed much well-sinking in the area of which you have spoken? A good deal, where there has been any prospect of getting fresh water; when fresh water was found in one place they have searched for it in other places in the vicinity. There is a vein of country running from Mooni down to the Narran Lake in which water has been found. Wells.

5214. Has it impressed you in any one instance as being more than ordinarily successful? There are two very good wells at Borora, near the Queensland border.

5215. On what run is that? The Gundabloui. On Gundabloui.

5216. What kind of well is it? Sand-drift, slabbed down about 6 feet square.

5217. What is the depth? I think not more than 30 feet; I know that they watered 1,300 head of cattle from it during a whole dry season. Depth.

5218. How is the water raised? Latterly by a horse and whim and self-acting buckets. Water-raising.

5219. Have you observed the result of the quick raising of the water? It lowers very rapidly, but rises again quickly. Supply.

5220. Do you know of any other people in this neighbourhood who could support that evidence? There is another well at Dungalear, between Narran and the Barwon, within a mile of the Borah Government tank. At Dungalear.

5221. What is the nature of that well? That is also a sandy soil.

5222. What is the water used for? There is a windmill, which supplies the garden, the house, and the the working horses. Windmill.

5223. Is the garden productive with that supply? As long as there is a full supply for it.

5224. You think that the country back from the Barwon, in the county of Finch, would be suitable for agriculture if it were irrigated? For pastoral purposes, it is some of the best land in this part of the country. Agriculture.

5225. Is it occupied? Yes, fully.

5226. Do you know of any wells on the banks of the Namoi? There is one at my own place, on the borders of the township, and there are several in the town. There is one at the brewery. Wells.

5227. Do you think that water is obtained by soakage from the river? I am hardly inclined to think that.

5228. Is the well at the brewery well supplied with water? Yes. My own is the same. It is much harder than river water.

5229. What is the depth of the well at the brewery? About the same as my own—about 42 feet. Depth.

5230. What depth of water does it give you? Sometimes we have 5 or 6 feet of water. I think my own has silted up of late years. I have known it to have 7 or 8 feet of water. The flood rose on one occasion over the surface, and we thought we should have to bale it out, but it lowered very rapidly to its own level, so that the ground at the bottom must be very porous.

5231. What is the size of your well? It is a circular well, about 4 feet in diameter. Size.

5232. Have you never applied a heavy test so as to see how much water you could draw without exhausting it? I have not. Supply.

5233. What do they draw in the brewery? I do not know, but I know it is a heavy supply.

5234. And the well never runs dry? No; the river is close to the brewery, and although the river might at any time be dry there would be water in the well.

5235. You think there is an underground current near the river? I do; I know a man who sank a well through a stiff pipe-clay in the centre of the bed. He sank the well 8 feet deep only, and the water then came in. He had 7 feet of water next morning, which he continued to use for months. That was at the worst time of the present drought. Underground current.

5236. Do you know of any other places where the bed of the river has been tapped for water? I have known of other places where they went 20 feet deep in the river bed and did not succeed in getting water. That was higher up the river. Wells in river bed.

5237. Are there any known indications in the sinking of wells with a view to avoid salt water? Only in the vein of country to which I have previously referred.

5238. What are the indications? A peculiar kind of timber. Indication of water.

5239. What timber do you find generally over suspected basins of salt water? I do not know of any difference in the timber on the surface. You may get salt water in one place, and within a few yards you may get fresh at the same depth. Timber.

5240. What timber is an indication? The foliage is generally greener and fresher where you find a fresh-water well.

5241. Have you observed the strata in those wells? Those I have spoken of are in sandy soil. Strata.

5242. Have they been carried to the full depth? Not always.

5243. What was the change as you approached the water? It is pipe-clay, and then there is less drift. The water comes in so fast that unless you close the box you cannot get down to the depth you intend. I think you would get a better supply if you went right through the drift, but you would require engineering skill to enable you to do so. I believe that all these wells are soakage wells. One of the best of this kind of wells is on Mr. T. K. Scott's run at Gingi. About twenty years ago I was camped where that well is now, and a very heavy thunder-storm occurred, the rain lasting about an hour and a half, and leaving a sheet of water at the spot where the well now is. Any one would have supposed that the water would have lasted six weeks at least, but in the morning at sunrise there was not a drop of it visible. Soakage.

5244. Taking this large area, in which district is there a constant supply? I do not know of any that you can depend on. Even the Gingi well, which is the best in the neighbourhood, would not stand a very heavy tax. If it were called upon to water 10,000 sheep I do not think it would stand the strain.

5245. Do you know of any large depression in the course of any of the dry creeks which by treatment might be made large water reserves? I think the Narran Lake is worthy of some study in that respect. The Narran in good seasons has been known to run for nearly twelve months. During those twelve months there were three or four floods in the river, carrying down an immense body of water, all of which went into Depressions. Narran Lake.

Mr. J. R. Doyle. 16 May, 1885.

into the lake and never left it—it did not discharge into the Barwon. There are large inlets from the lake running back for miles. These are surrounded on two or three sides by ridges which would be well adapted for throwing the water into the lake.

5246. Do you propose that the lake should be made a large reservoir? The proprietor of the adjoining station recently sank two wells. The soil consists of black coarse sand. You would not have looked for water in it, but an excellent supply was obtained. This was in one of the spurs of the watershed leading to the lake. The water was found in rock. There appears to be a rocky bottom to the lake. Mr. Mein is the lessee of the surrounding country.

Underground outlet.

5247. You do not know whether there are any outlets from that lake running towards Brewarrina south-westerly? I do not know, but I fancy there must be an underground current from it. The lake is so situated that it might drain to the south-west.

5248. *Mr. Donkin.*] Is there any water now in Narran Lake? Not in the main lake; there is a succession of lakes which fill one after another.

5249. Is there any depth? I never went into it.

Evaporation.

5250. It soon evaporates in dry seasons? The evaporation must be great, or there must be a great undercurrent.

5251. If the water were intercepted at any point, could it be conveyed to other parts of the country? In some instances you are surrounded by dry land.

Mr. Vincent Durand called in and examined:—

Mr. V. Durand. 16 May, 1885.

5252. *Chairman.*] What is your occupation? I am a gardener.

5253. Where is your land? Two miles up the river, on the Barwon.

5254. How long have you been resident here? Eight years.

5255. During that time you have been farming and gardening? Yes.

Farm.

5256. What is the size of your farm? 40 acres.

5257. Do you make a living on that farm? Yes.

5258. In what way do you use this 40 acres? I grow fruit and vegetables, and hay when there is a good season.

5259. Did you select the site on account of the quality of the soil? I thought it was best for gardening. I do not think the part I hold is much better than the surrounding country, but it is high land and out of reach of flood-waters.

Irrigation.

5260. Do you water your garden? Yes, by wells; last year the wells were not sufficient.

Wells.

5261. Is that river water? No, I do not think so, because when the river is in flood the level of the water in the well is not altered.

5262. What are you doing now for water? I get it from the river, raising it by pumps.

Pumps.

5263. What kind of pumps? One is 1½ inch, and the other is 2 inches.

5264. Have your any reservoir? No, I only raise the water on to the ground.

5265. Have you ascertained what you raise daily? No, I have not.

5266. How long do you pump? Sometimes all day. We generally begin early in a morning and cease at 12 o'clock. We then begin again at 5 and continue until dark.

Cultivation

5267. How many acres have you under cultivation? 10 acres of fruit and vegetables.

Produce.

5268. From these 10 acres you can produce enough fruit and vegetables to provide an income for yourself and family? We are now only four in number, but for the first five years eight of us used to live on the farm.

5269. This number of persons was maintained on the produce of the ground? Yes.

5270. Could you have done that if you had had only the ordinary rains? No.

5271. How many acres would it have taken with the ordinary climate? It would be impossible to say.

Effects of irrigation.

5272. Some years you might raise a crop, but that would go a very short way towards maintaining your family? You can do nothing without irrigation, but with irrigation you can grow anything.

5273. You think the soil on the banks of the river is suited to agriculture if it is watered? I do.

Water rate.

5274. If you had a farm of 500 acres, what would you be prepared to pay for a water supply for irrigation? £1 an acre.

Pagan Creek.

5275. You know the Pagan Creek? Yes.

5276. Is there a large basin there? Yes, it is very large.

5277. How far back from the Barwon River? About a mile and a half, where it commences, but it extends very far.

5278. If the water were prevented from flowing into the Barwon, it would be a big waterhole? It would.

Mr. Charles Neam Vaughan called in and examined:—

Mr. C. N. Vaughan. 16 May, 1885.

5279. *Chairman.*] You are a general merchant, and resident in Walgett? Yes.

5280. How long have you resided here? About seven years.

5281. Prior to the settling of the town of Walgett you were connected with the navigation of the river? Yes, I have been seventeen years on the Darling.

Creeks.

5282. In your experience during the time that the Darling was navigable, you have had opportunities of observing the state of the creeks discharging from that river? Yes.

5283. What was the length of your experience in navigating the navigable portions of the Darling and Barwon? It has extended over the last seventeen years.

Navigation.

5284. Can you give the latest date when you were able to navigate these rivers as far as Walgett? In 1877 I had two vessels specially constructed for the navigation of the river between Brewarrina and Walgett, intending them to trade between the two places. At that time I had interests in four places; Wilcannia, Bourke, Brewarrina, and Walgett, and I thought to run the trade at this end by means of these two vessels. In November, 1878, the flood-waters came down sufficiently to enable us to carry out this object. We brought the vessels to Brewarrina as far as the township to the point of Pitt-street. The river was again in flood in April, 1879, and again in August and September of the same year. At that time it was unusually high here; I should imagine that the depth of the water would be, as near as I can say,

Floods.

Mr. C. N. Vaughan. 16 May, 1885.

say, 40 feet above the present summer level; I know by observations at various depths, having had occasion to mark them by cutting the limbs of trees to let the steamers get through. In September of the year I have named I penetrated the Barwon as far as Collarindabri with the steamer "Brewarrina;" in that journey I traversed 150 miles of water.

5285. What was the draught of the steamer? I think that she was running with a draught of 4 ft. 6 in., but she was built to run with a draught of 30 in.

5286. Your load line was 4 ft. 6 in.? Yes.

Speed.

5287. In calculating your chances of making a trip on a winding river like this, how long would you calculate that the journey would occupy from Walgett, against a fresh for a distance of 150 miles? The greatest average speed would be about 4 miles an hour, unless you had exceptionally strong engines.

5288. In venturing so far up the river, would you calculate how long the flood-levels would stand at sufficient height to give you a draught of water? Yes.

Duration of flood.

5289. How long did the river remain in flood? For several months at that time, but I cannot give you the exact date. Several events impress the fact upon my memory very clearly: it was about the first or second time of the holding of Quarter Sessions here, and the Judge, the Crown Prosecutor, the present Speaker of the Assembly, and one or two other barristers were here. I was summoned as a juror, but His Honor allowed me to go with my vessels, so that I might return to take the party on to Brewarrina and Bourke, there being no other means of transit.

5290. During the sitting of the Court you had time to go up the river and back? On the conclusion of my trip up the river, I went up the Pagan as far as Eury Eury and brought down a clip of wool. At that time I had a telegraphic communication from Gundawindi as to the state of the river, and upon that we based our calculations as to how long the flood would last in the Barwon.

5291. What is the distance from the entrance of the Pagan Creek to the Eury Eury station? About 12 miles.

Pagan Creek. Thalaba Creek.

5292. As a matter of fact, does not Pagan Creek widen out into a large basin at that point in its course? I could not say. I also entered Thalaba Creek, at the Brothers Station.

5293. Is the creek deep there? I think that it would be a deep channel there.

Dams.

5294. Do you think that it would be possible to deal with that outlet by damming it? Yes, it would hold the water back for miles.

5295. How far? I do not know much about Thalaba Creek, but I know that it is flat country for many miles.

Sectional area.

5296. Has the creek a large sectional area? At that time it was as wide as the Barwon.

5297. If the water were impounded in it, would there be a very large quantity? Yes.

Eury Eury.

5298. What are the features at the Eury Eury Station? There is a very large reach of water.

5299. Do you know Pian Creek? No; I have travelled on it, but it has always been in a dry state.

5300. Do you think that water might be intercepted at different points on that creek, so as to make permanent water? Yes.

5301. It is about 110 miles long? I am not sure; I suppose that would be something like the distance.

5302. You do not know the outlet to Pian Creek on the Namoi? No.

5303. Were you towing a barge on the river? No.

Dimensions of steamer.

5304. What was the length and beam of your steamer? She was side-paddled; I cannot say the length, but I think about 60 ft.; she was about 8 h.p., and would go from 3 to 4 miles an hour against a current.

5305. What could she do in still water? From 8 to 10 miles.

Current.

5306. What do you estimate was the rate of the current against you? About 3 miles; it varies at different points of the river; the banks are very low-lying, and the water sweeps across the flat country.

Width.

5307. Suppose the river were to fall low, just leaving enough navigable water, would there be enough room for the steamer to clear it with her paddle-boxes? Yes.

Inlets.

5308. Between Bourke and the highest point at which you have been on the river have you noticed whether there were large inlets at flood-times? On this side of the river between here and Bourke there are two or three; there is Maara Creek and the Macquarie Marshes and Bogan River.

Full of creeks.

5309. Do you know the Macquarie? I do not know much about it. I may mention that all the creeks between Brewarrina and Walgett fall in the same ratio as the river when the flood-water subsides, and gradually become empty.

Current.

5310. Did you find that there was a stronger current when you were approaching Bourke than after you had left it coming up this way? I did not make any observations.

Sections.

5311. Is there any difference in the appearance of the river in regard to sections, as compared with any portion above Walgett? It may be a little wider, but the difference is very slight.

Waste of water.

5312. Did it lead you to suppose that there was any waste water in the swamps, or by soakage? I have not thought of it; the current appeared about the same in any portion of the river except at the sharp bends.

5313. Do not the people who navigate the river think that a great deal of the flood-waters must be absorbed before they reach the lower rivers? Yes; there are exceptions in which the water remains for a time.

Dam at Collarindabri.

5314. Suppose we were to dam the river at Collarindabri, where I understand there is a rocky ford, the water I suppose would be discharged over the county Finch towards the Big Warnambool and the Narran swamp? Yes; from a point near Terribie on the Barwon, on the Dungalear side. There is a creek supplied by the flood-waters of the river; that is discharged through the county Finch to a point near the Big Warnambool; the course of the creek is more than 10 miles distant from the Barwon. There is another creek which runs from the Mooni from above Gundabloui, and thence in a south-west direction towards the Big Warnambool; that creek I believe has not run since 1879. At a point about 6 or 8 miles below Walgett there is a rocky bed where a dam would back the water up as far as Goongra. When the Barwon is in flood and the Namoi at ordinary summer-level the flood back-waters extend back into the Namoi for a distance of several miles.

Development of the town.

5315. *Mr. M'Mordie.*] During your seven years' residence here has the township grown much in size? Considerably; it was growing very rapidly indeed until the present drought, which has checked its progress.

5316. It has been getting smaller? No, but it has been quite at a standstill of late; we only need a return of good seasons to ensure its continued progress.

Population.

5317. Has it as large a population now as it had twelve months ago? No, because families depending on local labour have had to seek employment elsewhere, on account of the drought.

Mr. C. N. Vaughan. 16 May, 1885.

5318. *Mr. Donkin.*] You know the river from Walgett to Brewarrina? Yes.
5319. What would be the difference in distance between a straight line and the bends of the river? I think that it would more than double its distance by the river.
5320. *Chairman.*] Do you know the difference between the level of Walgett and that of Bourke? No. Judging from my experience, I do not think that there would be much inducement to warrant any expenditure to provide means of navigation between those two points. If a railway line were constructed from Narrabri we should have all the accommodation which would be required.

Navigation and railway.

5321. Is it more important to keep the navigation open than to supply this thirsty country with water? To provide for navigation would involve far greater expenditure than would be necessary for the conservation of water.
5322. Which work would benefit the greater number? Many more would be benefited by the distribution of the water over the surface of the soil.
5323. You have seen the results of irrigation of small patches of soil on the banks of the river? Yes.

Irrigation and produce.

5324. You know that with cultivation and irrigation the soil will grow fruit and vegetables? Yes; the soil is capable of producing almost anything, so long as it has the necessary water. I produce a quince grown on the banks of the Namoi.
5325. Did you get that growth without the assistance of irrigation? No.
5326. But with irrigation the cultivation of fruit and vegetables might be carried on to an unlimited extent? Yes.

Mr. Walter Jones Pearson called in and examined:—

Mr. W. J. Pearson. 16 May, 1885.

5327. *Chairman.*] You are a resident of this district? Yes.
5328. You have been a resident here since 1879? Yes; I have been managing Ulumbi Station.
5329. Have you been managing it all the time? Yes.
5330. Where is it situated? It adjoins the town of Walgett; it is on the west side of the Namoi, near the junction of the Barwon.

Ulumbi Station.

5331. You have seen the worst of these dry seasons? Yes. I came when the 1878 drought broke up.

Area.

5332. What is the extent of your station? 36,000 acres. It was originally 46,000 acres.

Stock.

5333. What stock does it carry? About 8,000 sheep and 800 cattle.*

Losses.

5334. Without considering the increase, do you find that after all these dry seasons you have the same number of sheep? No. We have had losses through the drought, but it does not account for the stock going away, because we have removed a certain number.
5335. What did you lose by the bad seasons? About 5,000 sheep. We should have lost more if we had not removed them.
5336. At the time of their removal you had no feed on the station? Nothing.
5337. In what way do you account for it? Want of rain.
5338. Could you have held on if you had had a good supply of water on the surface? Yes.

Tanks.

5339. Do you depend on the Namoi for the watering of stock? My main watering places are tanks, but if the tanks gave out I should be forced to the Namoi.

Watting of stock.

5340. Why do you not prefer the Namoi? It is too far for the stock to go for water if water can be obtained in the back country.
5341. If your flocks were on the river bank you would water them there? Certainly.
5342. In the present state of the river could you water them there? I have not been unable to water them there since 1879; the waterholes never go dry—they have never been so low but the sheep could be watered at them.

Soil.

5343. What is the nature of the soil at those waterholes? Sometimes sandy, and sometimes black soil.

Tanks.

5344. You never had occasion to search for water in the river for the watering of sheep? No.
5345. How many tanks have you on the back run? Seven.

Capacity.

5346. Are they all of the same capacity? No; they vary from 2,000 to 5,000 yards.
5347. Which size do you consider the more economical? I prefer the 5,000 yards tanks. I think you get a greater depth, and they are quite sufficient for the number of sheep I had in the paddocks.

Form.

5348. What is the form of construction you like best? I would prefer a tank with a side batter 1 to 1, if the ground is firm, coupled with fencing in to keep the stock from it, pumping the water up for their use.
5349. Is there not great danger in high winds of the water eroding the banks and of their falling in? I have never found it so.

Spoil.

5350. How do you dispose of the earth which you take out of the tank? It is put about a chain away, or if it can be used for the conservation of water it is put round the banks. If you allow sheep to go to the waterhole it is better to take away the earth.

Evaporation.

5351. Have you made any observations as to evaporation? I cannot say that I have. The lower the tank gets down, the less the evaporation. I had a tank which, after a short interval, sank 1 foot in the absence of stock.
5352. Before watering the stock, do you gauge the level of your tank? No; in a small tank we know when we are going to find the bottom.

Silt.

5353. What provision do you make to prevent silt from going into the tank? We have catch tanks.
5354. Do you find that they prevent the silt from entering the main tanks? They get all the silt out of the drains, but not the silt that the sheep tread in off the batters.
5355. Have you found since you have been on the station that you have lost a tank by silting? No. One tank is silted three feet in eight years.
5356. What means do you adopt for cleaning the silt out of a tank? I have never yet had occasion to clean silt out of a tank. Having regard to the expense of the present mode of cleaning tanks I would rather abandon the tank. If it were a very large tank it might pay to clean it out.

Pian Creek.

5357. Do you know of any large holes in the Pian Creek that might be used for storage of water? No; I know that it lies in holes, but I have not noticed any of the places you indicate.
5358. Is it an impermeable bed? The creek retains the water in the holes for a certain time, but they eventually go dry.

5359.

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* Note (*on revision*):—This was in 1879; since then there have been more, up to 20,000 sheep, and as low as nil in 1884.—W. J. P.

5359. Suppose the water could be replenished, could we keep constant water throughout the creek? I think so. Mr. W. J. Pearson.

5360. To how many runs would it be serviceable? I do not know. It would be very useful near the outlet on the stock route. I may say that I have a small dam on the Namoi, but it is only an earthen dam. 16 May, 1885.

5361. How did you stop the flow of water when the dam was being laid in? I put a log on the bottom, and put in the earthwork before the water rose over the log. Dam.

5362. What was the flow in the river at the time you made the dam? I cannot say.

5363. What was the height of the log? About a foot. The river filled up 3 feet 6 inches to 4 feet behind the dam in a week. Height.

5364. What length was the dam? About 75 feet. It was made in a narrow place where there are two channels, one lower than the other. Length.

5365. How was it that the water did not rise more than 3 feet 6 inches? There was no water at the back, and the river stopped flowing. In case the water should rise to the crest of the dam, we provided an outlet in the second channel.

5366. Has the dam stood? No, it washed away, but it answered as a temporary dam. The water went back 2 miles to 2½ miles. The water remained six weeks, but diminished considerably by soakage and consumption by sheep; then the dam was washed away.

TUESDAY, 19 *MAY*, 1885.

At Brewarrina.

Present:—

MR. DONKIN, J.P., | MR. FRANKLIN, C.E.,
MR. M'MORDIE, M.I.C.E.

F. A. FRANKLIN, ESQ., C.E., IN THE CHAIR.

Mr. John Henderson called in and examined:—

5367. *Chairman.*] You are a resident of the district? I reside at Quantambone. Mr. J. Henderson.

5368. You have been a long time resident here? Four years.

5369. During that time you have suffered from extremely dry weather? Yes, during the last two and a half years. 19 May, 1885.

5370. You do not know the state of the weather as compared with former years? I have a record of the rainfall on an adjoining station. The record has been kept from 1872. The fall for 1883 and 1884 was smaller by 3 inches than the fall in any season since 1872. Rainfall.

5371. During the four years you have been in the district, have you observed a large loss of stock? Yes; it is variously estimated at from 20 to 30 per cent; in some instances considerably more. Loss of stock.

5372. By what was that loss occasioned? By want of both grass and water on many runs. Causes.

5373. A greater abundance of water would not have kept the stock alive without feed? No; unless with scrub, which we have not got on the north side of the Darling. I know of an instance in which stock were kept alive for twelve months by watering-tanks and by the felling of scrub; they had no grass, but they managed to keep their stock alive.

5374. Is your run on a river-frontage? Yes, on the frontage of the Barwon.

5375. Your station is very favourably situated with regard to water? Yes.

5376. The Barwon has been generally running during the past four years? Yes; very feebly sometimes, but always running. The Barwon

5377. Do you know whether any attempt has been made to keep the water back by means of dams? Not that I am aware of. Dams.

5378. I see that your run is watered on the western and north-western sides by the Culgoa? Yes. The Culgoa.

5379. Have you made any endeavour to keep the water back on the northern side of your run? On the Culgoa we, with our neighbours, have two overshot dams. Overshot dams.

5380. What is the result of these dams? One of them has been a thorough success; that is the one nearest the Barwon.

5381. How far is that from the junction with the Barwon? It must be about 25 miles.

5382. What is the nature of the dam thrown across there? It is constructed of timber, and the front slope is formed of earth against a puddled wall, as follows:—A centre row of piles 9 inches in diameter at right angles with the axis of the stream, 6 feet apart. The centres are capped with sawn timber 6 inches by 8 inches, secured by bolts through the head of every pile. They are 9 feet in the ground. These are supported by ties and struts up and down stream, fitted to dwarf piles sunk 5 feet in the bed of the river. On the up-stream side there is a puddled wall to the depth of the central pile 3 feet in width by the length of the dam. The filling in on the up-stream side is of ordinary earthwork, to the pitch of about 3 to 1. There is an apron extending 20 feet by the width of the river, consisting of weatherboards attached to a frame supported by dwarf piles 5 feet apart, and 5 feet centres. The crest of the dam is 8 feet 6 inches above the bed of the river. Construction of dams.

5383. Do you find that dam effective? Quite successful. There was a little scour about 50 yards below it, caused, I think, by a tree in the bed of the stream. Scour.

5384. There is no scour at the foot of the apron? No.

5385. Did you find it necessary to take the apron up the sides of the bank? Half-way up. It is carried across the flat bed of the creek and up the slopes to a corresponding height with the dam. Apron.

5386. Did you find any tendency in the banks to give way at the flanks of the dam? No.

5387. Did you extend the dam into the banks for any distance? Yes, for nearly 30 yards. We had a small dwarf wall of about 3 feet under the ground and above the banks on the flat ground. It is a wing, and it is constructed to prevent the water from flanking the dam. Dam in banks

5388. You have never observed the velocity of the water in flood-time? No. Velocity.

5389. Can you give us an idea? It is a sluggish current—it is slower than the Barwon. If the Barwon is very low and the Culgoa is flooded it is faster. It gets away very rapidly.

Mr. J. Henderson. 19 May, 1885.

5390. What would be the height of the average banks of the river above the crest of your dam? About 12 feet or 20 feet from the bed of the river.

5391. How far does the dam throw the still water back in the river? About 10 miles.

5392. That practically gives you 10 miles of permanent water frontage? Yes.

Use of water. 5393. And how do you avail yourself of the water you impound? I merely use it for the supply of stock—I do not raise it for irrigation purposes. I know of one case on the Birie where it could be done without raising it all. There is a channel where the water has run down on two or three occasions; there is an earthen dam there.

Levels of country. 5394. Suppose you carried a line of levels from the dam on the Culgoa, what would be the nature of the country? You would find it higher than the banks of the creek.

Dams. 5395. Do you know whether they are adopting the same principle above you on the Culgoa? Yes; I do not know whether the dams are actually erected, but contracts are let for the erection of two dams.

5396. You do not object to their placing extra dams up there? Not to overshot dams.

Current. 5397. How long would it take you to fill your dam with the ordinary current of the stream? I have known it to run over three hours after the current reached it—that is, when quite empty.

5398. I suppose there is generally a current running? For months at a time there is none at all.

5399. You fill the dam with an ordinary fresh, and get permanent water? Yes.

Waterholes. 5400. What would be the consequence if you were to leave the river entirely without obstruction? There would be several waterholes. They would last about three or four months; they could not be considered permanent.

Width. 5401. What would you consider the average width of the water surface with a wedge of 8 feet 6 inches deep? About 50 feet.

Cost of dam. 5402. What would be the cost of erecting such a dam? About £600.

5403. Do you think that the price could be reduced by adopting another system of construction? Yes; and the dam I am speaking of cost us more than usual, because it was constructed at a time of drought, when carriage was high.

Apron. 5404. I suppose the apron might be made of material other than planking? I should prefer to have it of stone.

5405. And if it were not available, would not corrugated iron do? Yes.

Slope. 5406. Would it not also do to hold back the slope of the earth? I would prefer planking. If the piles were put closer together it might do, but the pressure of the water might break the joints. I have used galvanized iron in another instance near Wilcannia. It was one-eighth of an inch thick; it answered in that case.

Other dam. 5407. Have you made any other dam on this river? At a distance of 10 miles above the dam I have been describing there is another; it is at the junction of the Culgoa and the Birie.

Result. 5408. Was it a success? It has failed on two occasions through the water passing under the planking. The piles did not reach to the bottom of the drift; the consequence was that when there was pressure above ground the stream passed right through underneath.

5409. Did it attain any height before the pressure affected the foundations? It had no great height; perhaps there were about 6 feet of water. I think we have removed this difficulty by deepening the planking and piles, carrying them 6 feet lower down to a firm bed; they now go 15 feet down.

5410. Did you sink puddled trenches 15 feet? Yes.

5411. How did you dispose of the water? There was a little soakage to contend with, but there was not more water than could be baled out.

Nature of beds. Drift. 5412. Do you consider that the beds of these rivers in the black-soil country are impermeable? Yes, excepting places where there is a large deposit of sand. The Culgoa has a great deal of drift, but we have not found it to be any drawback.

Silt. 5413. Did you find a large deposit of silt at the dam after a fresh? There has been no perceptible deposit.

5414. In your opinion, a dam similar in construction would be available for most of the rivers and creeks in this flat country? Yes.

5415. How long has the dam been up? Eighteen months, and it has been fully charged twice.

5416. How long is it since you had it charged the last time? Just two months ago the flood was at its height. At the present time the dam is perfectly full, and there is a very slight stream going over it.

Billabongs. 5417. Are there any billabongs on the Birie of any capacity for storing purposes? None that I know of; I have heard of some higher up.

5418. Do you know of any on the Culgoa? They have some on Milroy just above us.

5419. Are they utilized for the storage of water? Yes.

Dams. 5420. They are dammed at the mouth? Near the centre or lower end, I believe.

5421. And the water is stored at times of fresh or flood? Yes.

5422. You do not know how the dams are constructed? They are earthen dams. There are no sluices; they are made so high that the water never passes behind them.

Flood waters. 5423. Suppose there were only a partial flood which did not mount to the crest of the dam, the supply would not be replenished? No; the flood-water enters from above.

Under-sluice supply. 5424. Then no provision is made to ensure an under-sluice supply? No, but I think it would be an advantage to have such a provision.

5425. Do you know if the attempt has ever been made? No, I do not. I only know of one sluice, and that is near Wilcannia.

Storage. Soakage. 5426. Do you think that if, in this flat country, large quantities of water were stored on the banks of the rivers it could be utilized in time of drought, and could be sent into the river again? The storage would have to be very large, because the soakage is so great. Of course it would be beneficial to the lower parts of the river.

Waterholes. 5427. Is it not the case that in extreme droughts the waterholes in the lower parts of the Darling become stagnant for want of a current? They become very brackish.

Brackishness. 5428. Would a fresh supply reduce that brackishness? Yes, the water would be kept sweet.

Tanks. 5429. Have you any surface tanks on your run? Yes, a good many.

Excavation. 5430. How are they constructed? By excavation. The country is so flat that we cannot utilize the earth. As a rule we generally put it round the excavation in the form of an embankment, but it is of very little use to us.

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5431. What do you consider the most suitable size of tank for a run? A square tank with slopes about 3 to 1 on each side, unless the water is to be pumped out.

5432. Of what depth? About 14 or 15 feet, giving about 10,000 yards.

5433. Does that give a permanent supply? For a moderate quantity of stock; it will water about 5,000 sheep and be permanent for them.

Stock watering.

5434. When you do not water from the tanks, what provision do you make for the stock? It is pumped out as a rule, but I have not here done so, only in another part of the Colony; we pumped it into a receiving tank, and from there we let it fall into the troughs by means of valves.

Pump.

5435. What pump do you use? The M'Comas' pump.

Evaporation.

5436. Does evaporation at certain times take place more rapidly than at others? A great deal more rapidly at times. High winds are worse than extreme heat.

5437. How does the wind act on the water? The heat and wind combined seem to lick it up; the wind does not wash it up the embankments.

Spoil banks.

5438. Then when you lift the water would it not be an advantage to keep the spoil banks as high as possible? Yes, undoubtedly.

Area of run.

5439. What is the extent of your run? About 400,000 acres.

5440. Do you keep sheep or cattle? Sheep.

Number of tanks.

5441. With two natural water frontages, how many tanks have you made? We have twenty-six large tanks.

Capacity.

5442. Of a capacity of how much on the average? About 6,000 yards.

5443. Is that necessary in addition to the river supply? Yes; and we feel the necessity for making a few more.

5444. The Culgoa, the Birie, and the Bokhara, all discharge towards the Barwon? Yes.

The Birie.

5445. And do they discharge in the same ratio—are their slopes equal? The Birie has the least channel of the three, and discharges more quickly; the Culgoa runs next, and the Bokhara runs last.

The Bokhara.

5446. So that a very large tract of country might with a low flood be deprived of water from the Bokhara? Yes. There was an instance of that this summer. The Birie waters ran for four months continuously before the Bokhara ran through.

Regulation works.

5447. Do you think it would be an advantage to regulate the waters down the Birie so as to give you an equal discharge in the two? Yes.

5448. And you think that is a matter worthy of investigation? I do.

The Culgoa.

5449. How far from the junction of the Birie and Bokhara do both these rivers junction with the Culgoa? I am not certain about the distance—I think it is about 30 miles; the Culgoa is evidently the main stream.

Regulation works.

5450. If we could bring the currents to about equal force and discharge we could perform the same operations as to damming, both in the Bokhara and the Birie? Yes. The Bokhara has a great many dams in it already, enough to guarantee a permanency of water if the floods were equalized at the junction.

5451. All the work in these rivers has been done by private enterprise so far? Yes.

Private enterprise.

5452. Do you recommend the continuation of private enterprise in this work? Yes, in the way of overshot dams. The residents on the Bokhara are prepared to go to the expense of erecting a small overshot dam on the Birie to equalize the waters.

Creeks between Narran and Bokhara.

5453. Supposing that you equalized the waters, would it be possible to drain a portion of the water to run down between the Narran to the Bokhara? There are a few creeks which intercept the two rivers, running from one to the other, that is which run to the Narran and the Bokhara. I know of no creeks running parallel to either river.

Narran Lake.

5454. Would it be any advantage if the waters were prevented from running into the Narran Lake, and were conveyed parallel to the Bokhara down into the Narran country, so as to avoid the loss in the lake itself? Yes, it would water more country.

5455. Do you know of any dry creeks there? I know of some which discharge after the lake is filled.

Diversion.

5456. Would it be possible to convey the water from the Narran on higher ground above the lake, and connect with the creeks at the lower parts of the lakes, so as to get the water into the impermeable country? Yes; by connecting the present channels by cuttings, and making cuttings from the lower end of the lake in a south-westerly direction to the Barwon, would water more country than any other means I know of.

Creeks.

5457. You know of creeks running in that direction? Yes, the water has actually run there.

5458. What would be the distance to get the water from the lake into the lower channel? 20 miles.

Supply.

5459. Is there a large supply of water from the source of the Narran into the lake? Yes, at times.

Channels.

5460. No one channel that you are aware of would convey the water in the direction you indicate? No; I think that the channel might be made at about the level of the lowest part of the lake into the Barwon.

Creek from Narran towards Bokhara.

5461. What extent of country would such a work benefit? About 10 miles on each side of the cutting. I do not know that the channel ought to be put at the lowest part of the lake. From the top end the natural fall of the country is towards the bend of the Bokhara, a distance of 20 miles. A creek already exists in that direction. It would require deepening if the water were made to run often; it has been known to run, I think, only on two occasions. It would of course have to be dealt with at its junction with the lake. There is another tributary running due south from the Narran Lake to the Barwon; it discharges near the Booroona Station.

Wells.

5462. Have you done anything in the direction of well-sinking? I have no wells; we have never got through the salt-water; we depend upon the surface water. One of our neighbours has had a bore at work for ten months, and has not yet succeeded in getting fresh water; that is on Milroy. In most of the sinkings water has been found at about 40 feet from the surface.

Depth.

Surface water.

5463. Then you think that the attention of the Commission should be devoted to the storage of surface water between here and Walgett? Yes, between these points and Bourke.

5464. You never kept any register of the discharge of these three rivers? No.

Equalizing of Birie flood-waters.

5465. Have you any general information which you think would be of service to the Commission? I may say that some of the settlers on the Birie think that the equalizing of the flood-waters may injure them. I think that the persons who would suffer most would be those at the lower end of the Birie, Armstrong & Co.; and ourselves, and we are in favour of the thing being done. We are also interested in the Bokhara. All the Birie residents get their supply before we get it. I think the flood-water is ample for both. I think the

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the Bokhara people would modify their petition if the Birie people would agree to let the proposed overshot dam be a foot lower than the bar on the Bokhara.

5466. *Mr. Donkin.*] You mentioned the loss of stock? Yes; it has been about 30 per cent.

5467. Is that the general loss? I think, taking it all round, that would be about it.

Loss of stock. 5468. At Walgett we were told that the loss had been 60 per cent.? It would not average that here.

5469. Did you lose any stock through want of water? Yes, I did. We had some country that was unavailable through want of water, although we were usually well supplied with water on the frontages. When things became extreme with us we let the stock go back into that country. They had to go 15 miles back from the water to these paddocks.

5470. You use M'Comas's water-lift? Yes, principally.

Windmills. 5471. Have you used windmills? I have no faith in them unless there is a reservoir to hold about a week's supply of water. I have used them for gardens. I found that you require a week's supply.

Tanks. 5472. What guided you in selecting the positions of your tanks? We go between red and black soil country.

Drains. 5473. Have you excavated drains to these tanks? Yes, in some instances a mile and a half; we have main drains and small feeders. The main drains are made with a plough and scoop; the small ones are ploughed, and the loose earth is afterwards shovelled out.

New Land Act. 5474. Do you think that the provisions of the new Land Act will be conducive to making further improvements? No; because the improvements have to be handed over at the end of the lease without compensation, otherwise there would be a great deal more water conservation.

5475. Do you not consider that you have sufficient security under the Act? The inducements to improve are lessened so much by the provision to which I refer that people will not do more than they feel they are absolutely obliged to do in order to utilize the country, otherwise I think private enterprise would afford an abundant supply of water for bad times.

Cato Creek. 5476. You know the Cato Creek? Yes.

5477. Is there any permanent water in it now? There are several waterholes.

Length. 5478. What is the length of its course from the Barwon into the Bokhara? About 25 miles.

5479. But by following the bends of the river? I should say quite 40 miles.

Channel. 5480. And the channel, is it as large and deep as those of the Bokhara and Barwon? It is a great deal wider and deeper than the channel of the Bokhara; it is almost as wide as that of the Barwon, and fully half as deep.

Width and depth. 5481. What is the average width and depth? It is about 150 feet wide, and the depth would be about 20 feet.

Dams. 5482. Would there be any difficulty in damming it where it enters the Bokhara? There is a place 3 miles east of the junction where that could be easily done. There is a rocky bar there which already forms a dam of 3 or 4 feet.

5483. Is that like the Fisheries here? Yes, on a smaller scale.

5484. Have you any dam on that creek? No.

Rocky bar. 5485. Would they be of any use in conserving water for the run? Yes; the rocky bar I speak of is on a reserve, or something would have been done with it before now.

5486. You think then that a large body of water could be conserved in that creek? Yes, easily.

5487. What dam would you recommend? Stone and cement overshot.

Tarrion Creek. 5488. Do you know the Tarrion Creek? Yes.

5489. It is similar to the Cato? Yes; but it requires a much higher flood in the Barwon to cause it to run.

5490. Can you say what height the Barwon would have to be above the present level in order to cause the Cato to run? About 15 feet.

5491. Could the Tarrion Creek be made use of in the same way as the Cato for the conservation of a large body of water? Not to the same extent; because at the upper end there is a great flat piece of country, and 6 or 8 miles below that it bends out again. There are 8 miles of well-defined creek that could be treated in that way.

The bar. 5492. What height is the body of the Tarrion above the body of the Cato? I do not know; the bar is almost 30 feet above the summer level of the Barwon.

Expenditure on water conservation. 5493. *Chairman.*] What proportion of expenditure in the management of a large station like yours would be set aside for water conservation as an annual expense? During the four years we have been on the place our expenditure under that head has been about £3,000 annually. I do not think it would average that by a very long way.

Water rate. 5494. Considering the large expenditure for water conservation and the possible loss by partial failure, what amount of money do you think the pastoral tenants would voluntarily pay for a constant supply on their stations? I think they would willingly join in the work.

5495. *Mr. McMordie.*] Would the people who benefited be willing to pay a rate sufficient to cover the interest on the expenditure, and to form a small sinking fund with which to extinguish the cost of the works? I believe they would.

Trusts. 5496. Under what form of management should these works be put? I think they should be managed by Local Trusts, and the works might be divided into districts, and be supervised by a resident officer appointed by the Local Trusts.

Benefits. 5497. You think that a provision well thought out for the conservation of water in these rivers would be of general benefit to the whole of the back country? I do, assuredly.

5498. And you think that your opinion would be supported by evidence in this district? Yes. All the residents I know of who have discussed the matter with me entertain views pretty much the same as my own.

Weir. 5499. *Mr. Donkin.*] Is it possible, when a foundation can be obtained, to put a weir across the Darling? Yes, wherever you find the rocks.

The Fisheries. 5500. What is the height of the natural weir at the Fisheries? About 8 feet.

5501. Has it been tested? Yes, but I cannot remember who did it.

5502. Is the river now at its ordinary summer level? Yes.

5503. How far at the present level does the weir throw the water back? To somewhere near the Boorooma boundary, about 30 miles from here.

5504.

5504. Do you think that the putting of such weirs across the Darling would induce channels to cut up on either side, such as the Cato and Tarrion Creeks? Not as long as you have an overshot and low-crested weir. Mr. J. Henderson. 19 May, 1885.

5505. Do you think that the present weir has anything to do with the formation of these natural channels? No, I do not think so.

WEDNESDAY, 20 *MAY*, 1885.

At Brewarrina.

Present:—

MR. BARTON, M.P.,
MR. DONKIN, J.P.,
MR. FRANKLIN, C.E.,
MR. M'MORDIE, M.I.C.E.

F. A. FRANKLIN, ESQ., C.E., IN THE CHAIR.

Mr. Richard James Kelly called in and examined:—

5506. *Chairman.*] How long have you been a resident in this district? In the Bourke district for twenty-two years. Mr. R. J. Kelly. 20 May, 1885.

5507. Are you well acquainted with the country all around Brewarrina and Bourke? Yes, I have a fair knowledge of it.

5508. How far does your knowledge extend from Brewarrina to the eastward and to the westward? I have been about 40 miles below Bourke, to Gundabooka and the boundary of the district of Cowper, and eastward as far as Boorooma.

5509. Of late years you are aware that the country has suffered great losses of stock? Yes. Loss of stock.

5510. To what do you mainly attribute that loss? I attribute it to the scarcity of food and deficiency of water.

5511. At what rate do you think the loss has been, taking a general average, within the radius you have mentioned? I cannot exactly say; it has been heavier in some parts than it has been here; the general average in the district of Brewarrina has been about two-thirds.

5512. Have you known any great scarcity of water in the Barwon River, on the frontage between Boorooma and Brewarrina? In some places there has been a scarcity of water in the river itself. The Barwon.

5513. You have personal experience of the drought as a selector on the Tarrion Creek? Yes.

5514. What is the area of your selection? 640 acres. Area of selection.

5515. Is it situated on the banks of the creek? Yes. Situation.

5516. How has the creek been generally during the time of your occupation? We have had water, but it has been very low lately. Tarrion Creek.

5517. Is the creek supplied by back-water from the Barwon? It runs out from the Barwon; it is on the south side of the Barwon, the same as the Cato.

5518. At a point how far east of Brewarrina does the water enter Tarrion Creek? About 30 miles.

5519. What is the extent of Tarrion Creek from the river? It empties itself into the Bogan—about 40 miles.

5520. What is the nature of the creek—is it deep with steep banks? In some places it is very deep, and in others very shallow. Banks.

5521. What is its course—is it very tortuous, or does it run straight? It is in the form of a circle; it winds very much in its course. Course

5522. Have you seen the creek in times of flood? I have. Flood.

5523. Is there a great velocity of water in the river at the time of discharge? Yes, there is a great fall. Velocity.

5524. Has any attempt been made to dam any portion of the creek? Yes, there is a dam over it now. Dam

5525. Where is that situated? About a mile from the crossing to Byrock, on a run called Charlton. Position.

5526. What is the nature of the dam? It is simply an earthwork dam; I may state that when the dam was first erected it threw the water back 10 miles. Dam

5527. What is the height of the dam? About 24 feet. Height.

5528. Is it placed up to the level of the natural banks of the creek? Higher.

5529. Are wings carried out from the top of the dam into the sides? Only to a small extent. Wings.

5530. What is the effect of the obstruction of the water on the surrounding land? It floods a great deal of it; in times of flood, on account of the dam, the mails have to go 5 miles higher up. Effect.

5531. You say that the dam withstood the pressure of a flood? I think that it has done so.

5532. What was the effect on the dam? The dam stood it.

5533. Did the wings suffer? They suffered considerably, but the top portion of the dam stood it very well.

5534. What was the object of building the dam so high—would not an overshot dam have been better? We did not know as much about the matter then as we do now.

5535. How long ago was the dam built? Twelve years.

5536. Is it still in existence? Yes.

5537. And it has served its purpose several times? Yes.

5538. How long does the water which is thrown back last? In one case it was permanent for three years. Permanency of water

5539. It was never exhausted? No; there is water there now which is the remnant of the last flood.

5540. When the dam was erected, was any objection raised by the people below? They objected to be cut off from water at the lower end, but few persons were interested; the chief persons interested were the Brewarrina people. Objections.

5541. Were any measures adopted to convey the water beyond the wings by any watercourse into the creek again? No.

5542. Would not that have given a quick discharge into the lower part of the creek? I think so. Discharge.

5543. I suppose that when the creek is in fair flood the obstruction of the dam would be a small item in the obstruction of water sent down? It would make very little difference.

5543½. It is only in small floods that the people would suffer? Yes.

5544.

Mr. R. J. Kelly. 20 May, 1885.

5544. Do you think that if a dam were placed in such a creek with means provided for the discharge of water to the lower parts of the creek in proportionate quantities that any objection would be taken? I think not.

Series of dams. 5545. Do you think that the placing of a series of dams on the length of the creek at intervals would be beneficial to the district? Yes; I think it is one of the best creeks in the district for that purpose.

5546. If that one creek were so treated, what extent of country would be benefited on its line? It would give about 40 miles of water-frontage.

The Birrie. 5547. Do you know of any other creeks in the neighbourhood which could be treated in a similar way with similar results? I know of a number of creeks, but I have had no experience of them; I know the Birrie, for instance; I have seen them all in flood, but I have no special knowledge of them; there is any amount of water in them.

Dams. 5548. What description of dams are erected on the Bokhara? Earthwork.

5549. You do not know of a timber one on Mr. Henderson's run? No.

The Cato. 5550. You know the Cato Creek? Yes.

5551. Is that a very large opening? Yes.

Storage capacity. 5552. There would be a large storage capacity for water if it were retained? Yes.

5553. Do you know its inlet from the river? I do not.

5554. As far as you remember, would it be a work of great magnitude to enclose it with a dam? I do not think so.

The Barwon. 5555. Do you know of any part of the Barwon which might be treated for a low-level dam? Yes; I think the rocks above Boorooma might be so treated.

Rocks. 5556. What is the nature of the rocks—are they visible on the banks of the river? Yes, I think so.

5557. Is there a large quantity of stone in that vicinity which might be obtained for the erection of a weir? Yes.

Country. 5558. What is the nature of the country about that position—does it seem to fall away to the river and offer a line for drainage? It appears to be level.

Weir. 5559. You have seen the weir close to the town? Yes; it is a natural weir.

Sluices. 5560. But the arrangement of sluices is artificial? It is the work of the blacks.

5561. The result of that obstruction is to raise the water-level of the Barwon above? Yes.

Fall. 5562. To what height? The fall would be about 8 feet.

Effect. 5563. Without that obstruction, would not the river at some times during your experience have been quite dry? I think that it would have been.

5564. But it never has been? There is always any amount of water above and below; I have seen the river dry at the crossing-place.

5565. So that this natural weir has been the means of providing you with a permanent supply of water? I consider so.

5566. Do you think that a succession of weirs on the river of the same proportionate height would have the same effect throughout its length? I do.

5567. And that it would not materially interfere with the general flow of freshets and floods? If it were a heavy flood it would throw the water back.

Erosion. 5568. Would it have the effect of eroding the banks at the site of the obstruction? I do not think so.

5569. Is that your opinion, or have you heard it stated that this natural obstruction here was the cause of opening any creeks above it within a distance of 8 or 10 miles? Not to my knowledge.

5570. You are not aware of any damage having been done to the banks above this obstruction? No.

5571. It has never, within your knowledge, shown a tendency to disturb the original formation of the banks at its own site? No.

Bars for weirs. 5572. Do you know of any position below Brewarrina towards Bourke which would be suited to the same treatment in the way of weirs? I know of one about 20 miles from here, between Beemery and Bourke; they call it Vincent's Old Crossing.

5573. What is the nature of that crossing? A stony bar.

5574. Is the river copious at a point above it? Yes.

5575. Suppose a weir were raised at that point 8 or 10 feet high, how much back-water would it give? 10 feet would throw it back about 7 miles.

Culgoa. 5576. Do you know the county of Culgoa? I do not know much about it.

5577. Have you been towards the border in that direction? I have.

5578. Did you come across any creeks there? I have seen swampy ground there.

Country. 5579. What is the nature of the country? It is generally flat, but there are some rises.

5580. In what direction does the water flow? Towards the Culgoa.

Creeks. 5581. You do not know of any established creek of any magnitude as far as you went? The Culgoa itself is the only one which I know of.

Settlement. 5582. Is that pretty closely settled for pastoral purposes? Yes.

5583. In what way do they supply themselves with water? From the Culgoa.

5584. Generally, I suppose, stock is watered by tanks? I did not observe any; I was there in flood-time.

The Birrie. 5585. Are you aware that the Birrie discharges a great deal more water than the Bokhara—that the Birrie is frequently full of water when the Bokhara is empty? I do not think there is much difference.

5586. When one is supplied they have very little to complain of in the other? I do not think there is much difference; I have heard it stated that the Birrie takes a larger quantity of water.

5587. You are not aware that it is a more deeply depressed river in regard to level than the Bokhara or the Culgoa? Not that I am aware of.

5588. You have no personal experience of water in the Culgoa country? No.

Settlers. 5589. Do you know of any settlers between the boundaries of Gundabooka and the Culgoa? I know of one—Mr. Colless.

Permanent supply. 5590. Do you think that with close examination the natural waters might be so regulated as to keep up a permanent supply in the large district you have mentioned? I do.

Water rate. 5591. And if it were done successfully, under proper supervision, do you think that the people who would be benefited would be prepared to pay for the use of the water in any proportion to their loss of stock over a series of years? I believe that the majority would be inclined to do so.

5592. You think that they would voluntarily pay for the use of water which would avert the loss of stock? I think so.

5593.

Mr. R. J. Kelly. 20 May, 1885.

5593. Can you give us any information in connection with creeks and rivers at this point which would be useful to us, taking the whole system of the Culgoa and the main river? It has often struck me that if dams were put in the creeks at various points there would be a great saving of water.

Depressions.

5594. Do you know of any large billabong or natural depression on either side of the rivers named where the water enters at flood-time and recedes as the river recedes, leaving them dry? I do not remember any now.

5595. Do you know that such billabongs exist in large dimensions above this towards Walgett? I do.

5596. Do you think that they could be converted into reservoirs? I am sure they could; I know of several here, between here and Bourke, which would answer the same purpose.

5597. Where are they situated? After you leave Yambacoona, and before you get to Beemery, there are three big places.

Capacity.

5598. Are they very extensive? Very large; an enormous amount of water could be stored in them; I think that the supply could be made permanent.

Use.

5599. Do you think that if we found many such depressions in the banks of the rivers, they might be availed of in some manner so that the water stored might be beneficial at the time of extreme drought, by being discharged again into the bed of the river to keep it flowing? I think that it would be much better to keep it for the stock, allowing them to water themselves at the billabongs.

Constant flow in Darling.

5600. When the Darling and Barwon are very low, and become a series of waterholes, stagnant and boggy, do you not think that it would be a good thing to endeavour to keep up a constant steady flow of water in the beds of the rivers? Undoubtedly it would.

Watering back country.

5601. You are not aware that at the sites of these billabongs there are means whereby, by excavation, water could be carried into the back country by drainage works? It could be done quite easily.

5602. Then you recommend that closer examination of these places be made to ascertain that fact? Yes.

Flood-waters.

5603. How often have you seen the flood-waters of the Barwon enter Tarrion Creek? Four times in twenty years.

5604. On each occasion did the water remain sufficiently high to discharge water throughout the length of the creek? Yes, it flowed right through for weeks and weeks; we had it flowing for six weeks.

5605. Is your selection on Tarrion Creek above or below the dam on Charlton Station? On the upper side of the dam.

5606. You get the benefit of the water? Yes.

Length of creek.

5607. How far below your selection does the creek run out into flats? About 18 miles.

5608. That cannot be far off the Bogan? It is quite close to it; it must be in conflux with the Wet Bogan—the river proper.

Banks.

5609. Are there clearly defined banks all the way down? Yes.

5610. So that another dam could be erected if necessary? Yes.

Tarrion and Cato Creeks.

5611. What is the size and capacity of the Tarrion Creek, as compared with the Cato? It is superior to the Cato.

5612. Are the banks steeper? The Cato banks are steeper in one way, but the Tarrion is much wider.

5613. At what height does the Darling rise above summer level before it enters the Tarrion? I think it would have to rise 25 feet; the Cato runs long before the Tarrion.

Diversion into Tarrion Creek.

5614. Do you know of any site on the river banks above that point where an excavation could be made to discharge water at a lower level into the Tarrion? Yes; up towards the Marra water could be let into the Tarrion without any very great extent of work.

Velocity.

5615. Have you noticed whether there is a greater velocity of water at the entrance to the creek than there is lower down? Immediately on entering the creek the water runs faster.

Soil.

5616. What is the nature of the soil at the entrance to the creek? It is black soil.

5617. Is it friable? I think it could be deepened at very little expense.

5618. Have you noticed that after floods have subsided the off-take of the river has quickly become drier than the lower parts? Yes.

Bed.

5619. That indicates that the bottom of the creek is higher than the general bed lower down? Yes, much higher.

5620. *Mr. Donkin.*] What height above this weir would the river have to rise before discharging into the Cato? I think about 15 feet.

Diversion into Cato Creek.

5621. What would be the distance from the river to the Cato? I could not give you any idea; it would have to be a rise of 23 feet from the bed of the river at Brewarrina to flood the Cato.

5622. Do you know as a matter of fact the distance is 39½ miles? I did not know that; I should have said about 20 or 25 miles.

5623. Have you any means of knowing that what you state is correct by any gauge? I know from what I have heard from residents who have taken measurements in the rocks, and can form a good idea from these.

Gauge.

5624. You have no gauge in the river now? No.

Depth.

5625. What depth of water is there above the weir at the present level? I believe it will average from 15 to 20 feet.

5626. What is the greatest depth? In some places I think that it would be 25 feet.

Silt.

5627. Have you observed any great deposits of silt above the weir caused by floods? No; there is deep water at the back of the weir at the present time.

5628. There are no beds of silt? No.

5629. Is it shallower now than it was last summer? Yes, a long way; there is no comparison.

Flow of water.

5630. There is no opening in the weir to regulate the flow of water—to allow a rush of water through it? Not that I know of.

Length of weir.

5631. What is the length of the weir down stream? The bed of stone is about a quarter of a mile long.

5632. You do not know of any similar bar on the Darling? Not so extensive.

Lagoon.

5633. At Yambacoona, is not the bed of the lagoon almost as deep as the river itself? Yes; an immense body of water could be stored there.

5634. What is the length of it? As near as I can remember, it is about 3 miles around—it forms an island.

5635. *Mr. M'Mordie.*] Is there any marked difference in the times at which the Bokhara, the Birrie, and the Culgoa flow after rain? I could not say from my own knowledge.

Mr. R. J. Kelly. 20 May, 1885.

5636. Is there any cultivation of cereal crops in this district? Wheat and hay have been successfully grown at Gongolgin, but not by irrigation.

5637. If water were conserved in these creeks, would there be any extensive cultivation? I am sure there would be; I have tried irrigation on the red soil, and I found that the plants grew rapidly.

Crops. 5638. What would be the proportion of crops from irrigated land, as compared with crops from non-irrigated land? There would be an immense difference in favour of irrigation.

Effect of rain. 5639. What is the effect of 1 inch of rainfall over the general soil here? It would give us a good start—it would make the grass spring up several inches.

Irrigation. 5640. To what extent would irrigation be carried on if water were available—would it be carried on to the full extent of the supply available? I decidedly think so.

Water rate. 5641. Can you give us any information as to the rates per acre people would be willing to pay for water for irrigation? I could not say.

5642. What would it be worth? I could not say per acre.

5643. Do you think it would be worth £1 per acre per year? I think it would, especially in time of drought.

5644. *Mr. Donkin.*] As a matter of fact, people do not now use water for irrigation where they have it? No.

Selections. 5645. *Mr. M'Mordie.*] Without any works for the conservation of water in this district, are selections of any great value—could a man support a family on a selection in the present state of the country? In its present state he could; just now I consider we are having a first-class season; in ordinary seasons he could not live on it continuously; I speak from experience.

Settlement. 5646. If water were stored it would tend to increase settlement? Decidedly; it would be impossible for a man to live on 640 acres in this part of the country unless water were stored.

5647. *Mr. Donkin.*] You know that red soil, with water, will grow almost anything? It will.

5648. It is far preferable to the black soil? I have tried both, and I think the red the better.

Pink Hills. 5649. Are you acquainted with the route beyond the Pink Hills towards Byrock? I know that part of the country.

5650 How is it watered? Very badly.

Supply. 5651. Does it receive any supply from the Bogan? I do not think so; after you leave the Bogan you have no natural water.

5652. You do not know from any local floods or heavy rains in which direction water flows from the Bogan towards Byrock? If there are heavy rains the water would flow into the Bogan.

Places for storage. 5653. The road to Byrock is over dry country? Yes, but there are a number of places where water could be stored; there is a place where the Government now are constructing a dam for the conservation of water.

Byrock. 5654. The country between Byrock and the Pink Hills must be watered by tanks? Yes; there is no natural water from Pink Hills to Cobar, a distance of about 125 miles.

5655. Do you know that at Byrock there is a rock in which there is supposed to be water always? I have seen it dry, but very rarely; it could be made a great place for the storage of water.

5656. How far is that from the township? About 1¼ mile.

Mr. Colin Mackenzie called in and examined:—

Mr. C. Mackenzie. 20 May, 1885.

5657. *Chairman.*] You are a runholder here? Yes.

5658. Where is your run situated? On the Culgoa and the Birrie.

5659. What distance above the junction with the Barwon? About 50 miles.

5660. You have a water frontage on both the Culgoa and the Birrie? Yes, a double frontage.

5661. What is the extent of the run? 437,000 acres.

Area of run. 5662. What is the nature of the stock? Sheep at present. We had cattle, but they nearly all died.

Stock. 5663. What was the cause of the loss of the cattle? Dry seasons, and scarcity of grass and water.

Loss of cattle. 5664. In which particular do you suffer most? Mostly in regard to grass.

5665. Would a greater abundance of water have saved your stock? It would have saved a great many.

5666. During the past five years, have you suffered considerably from loss of stock? During the last three years our losses have been very great. During the two years previous we lost nothing.

5667. What is the distance on your run between the two frontages on your run? 10 miles.

5668. Have you any intermediate water? No.

5669. So that your stock can be on two frontages constantly? Yes.

Water supply. 5670. In which river do you find the most constant supply of water. The Birrie runs oftener than the Culgoa. When they both cease running there is not much difference between them. Weilmoringle is the head station, and Kiengal is the station on the Birrie.

Stock. 5671. What stock have you now? 40,000 sheep.

5672. Do you consider that you are fully stocked? No.

Season. 5673. Do you consider that this season is a good one? Not with us.

5674. Then the grass that we have here is somewhat local? Yes; it does not extend past Tullawanta.

The Birrie and the Culgoa. 5675. You say that the Birrie is more reliable for a water supply than the Culgoa? It runs some time when the Culgoa does not run at all.

5676. Can you give me any reason for it? There is a sandbar in the Culgoa where the rivers divide; that is in Queensland.

Dams. 5677. Have you made any effort to retain water in the Culgoa by dams? Not by permanent dams.

5678. But by temporary dams? Yes; when the river is low we generally put in two or three tail dams.

5679. To what height do you build these? We generally stop when they will hold 4 feet of water.

5680. What do you do to prevent it from rising more than 4 feet? We make the dam when the water is low, and when it rises 4 feet we put in another dam higher up to prevent the overflow; and if it is too high for us to hold we cut a channel round through the solid bank.

5681. You have never had your earthen dam washed away by the water? Yes, we have.

5682. What was the result? We lost the lot.

Nevine Creek. 5683. Is the Culgoa supplied by any other stream running through the county of Culgoa towards Queensland? The Nevine Creek joins the Culgoa on our run; it is called the Bourbon in our part of the country; it is known as the Nevine in Queensland.

5684. Is that a creek of any magnitude? It is a very fair creek a long way up. Mr. C. Mackenzie.
5685. How far have you been up? About 80 miles above our boundary, and there you can hardly trace it; it spreads out into a flat.
5686. When it joins with the Culgoa on your run it is a well-defined creek? Yes; all through our run it is a good creek. 20 May, 1885.
5687. Have you done anything towards locking the water on the Bourbon? We made a large dam, and had a splendid supply of water for one year, but the next year we had a flood which, in a few days cut a by-wash larger than the main creek—it made a new outlet. Dam on the Bourbon.
5688. Would that have been prevented if you had carried wings from your dams some distance on both sides? We had wings, but the natural overflow was not sufficient to carry all the water off, and it went over the wings. Wings.
5689. You think that a properly constructed weir would have received the pressure of the water? Yes. Weir.
5690. What was the height of the dam you raised there? Above 6 feet above the level of the bank. Height of dam.
5691. What was the depth of the creek? About 8 feet. Depth of creek.
5692. What back-water would that give you if it were naturally filled? About 9 miles straight behind the dam. Back water.
5693. You had that for a long time? For a year.
5694. Then the temporary dams that you made on the Culgoa would be below it? No; above it.
5695. And you do not know of any attempt being made on the Culgoa between that point and its discharge into the Barwon to obtain more permanent water? No. Works on the Culgoa.
5696. Are you acquainted with the overshot dams on the Birrie River? Yes, I have seen them. Overshot dams on the Birrie.
5697. How do they stand? They seem to be a great success—they stand well.
5698. They do not bring about the same result as that which you have mentioned; that is, they do not turn the water into a different channel? No.
5699. Do you know the details of construction? Yes. Construction.
5700. And you know them to be a great success? Yes. Success
5701. How many of them are there on the Birrie? Three. Number.
5702. And do they hold back a permanent supply of water? Yes. Supply.
5703. Does that give you the idea that the Birrie River is at a lower level than the Culgoa? The dams on the Birrie are not far apart, and they back the water up from one dam to another.
5704. Has the Bokhara been treated in the same way? No; it has been treated more harshly. They have earth dams all the way up—fourteen in all I think. The Bokhara.
5705. Have you any reason to believe that more water finds its way down the Birrie than down the Bokhara? Yes; I think the first obstruction on the Bokhara is too high, and throws the water back to the junction. Discharge.
5706. And by regulating the levels you think the discharge might be made equal down the two rivers? There is now a small bar at the mouth of the Bokhara about 18 inches higher than the new channel of the Birrie. There is silting between the upper dam and the bar which I have mentioned. Three or four dams on the Bokhara have been cut, and the water has been got right through.
5707. If the dams could be reduced on these two rivers by sluice opening, would that be a benefit? It would be to the Bokhara people, but not to the Birrie people. Sluice openings.
5708. If the water in the Birrie were regulated so as to fill the dams, would the balance discharge through the Bokhara be a loss or advantage to the other settlers? It would be a general advantage. Regulation of the Birrie.
5709. On your land on the Culgoa, what system do you adopt to water stock back from the river? We have tanks and wells. Stock watering.
5710. How far back into the country of Culgoa do you go? About 40 miles.
5711. How far back is your frontage line, for the occupation of stock, from the Culgoa waters? 5 miles back; then we have the Bourbon, which gives us (say) another 7 miles; then tanks.
5712. *Mr. Donkin.*] You know the whole course of the Bokhara? Yes.
5713. Is it longer than the Birrie? I do not think so; it is called the Birrie before the Bokhara breaks out. Course of the Bokhara.
5714. Is the Bokhara channel as deep and as large as that of the Birrie? No. Channel.
5715. Do you see any reason why the dam should not be put where the two rivers break out, so as to regulate the flood-waters? I think it would be hard on the residents down the Birrie. Flood-waters of the Birrie.
5716. Why should they have a larger supply than the residents down the Bokhara? The Birrie is a natural watercourse, and when our country is appraised we have to pay a higher rent for it. If the people had not put so much money into big dams on the Bokhara the water would have run through that river as often as it runs through the Birrie. Supply.
5717. The Bokhara waters more dry country than the Birrie? I do not think so; it goes through about the same extent of country. It is only 10 miles from the Bokhara to the Narran. The Bokhara and Birrie.
5718. Has the Birrie run this season for several months when there was no water in the Bokhara? It has. The Bokhara ran at the top end, but not lower.
5719. Has the Birrie run right through? It has, but it is not running at present.
5720. Has there been waste water in the Birrie? Yes.
5721. Is the Culgoa a secondary channel to the Birrie? Yes.
5722. And has the Culgoa been running through? Yes.
5723. Overflowing to the Barwon? Yes. The Culgoa.
5724. Do you know the Narran? A little; I have been on it several times, but I have not lived on it. The Narran.
5725. How does it compare with the Bokhara and the Birrie, as regards channel? It is larger than the Bokhara, but not so large as the Birrie.
5726. There is no objection on that river to the water being stopped? Not that I have heard of.
5727. Does it run out of the Ballanne? Yes, a long way up.
5728. *Chairman.*] Would it be possible to tap the waters of the Narran at the top of the lake and take them across the country to the Bokhara? I hardly think so. Diversion from the Narran.
5729. What is the nature of the country? Very flat boggy country upon the plains. Country.
5730. Are there any small creeks in this country discharging into the Bokhara? Not till you get below the lake. Creeks.
5731. But it shows that the drainage level would be somewhere in that direction? Yes.
5732. Do you think it would be worth examination in the way of levels? I do not think you would get enough water down the Narran to do any good. Levels.
5733. But enough water comes down the Narran to fill the large lake? Only sometimes. Supply.

Mr. C. Mackenzie. 20 May, 1885.

5734. But does it not also flood the land towards the river? Yes, but very seldom; I have seen it only once.

5735. How many tanks have you on your run in the county of Culgoa? We have only three at present.

5736. What is their dimensions in cubic yards? Some of them about 7,000, and the others are small, about 4,000 or 5,000 yards.

Tanks.

5737. What sites do you select in sinking these tanks? I generally get on to some hard plain of red soil. In that country we have some good clay-pans.

Depth.

5738. What is the most reliable depth? I think we go down to almost any depth you like.

5739. What is the depth you prefer in order to prevent evaporation? About 15 feet. I have not had much experience in tanks yet. The tanks are now filled for the first time. It is the first rain we have had since we put them down.

Wells.

5740. Have you had greater experience in wells in that part of the country? I hardly know whether you call them wells or springs. The deepest point at which we have obtained water is 23 feet, and the lowest is 3 feet.

5741. Speaking of them as springs, do you find the water rising to the surface as indicating the place where you should sink? Some of the wells, after they have been opened out, run over the surface.

5742. You have not tried the tube down in one of those places? No.

Supply.

5743. Having obtained water in this position, is it permanent? Yes.

Quality.

5744. Perfectly pure? Splendid water.

Supply

5745. Do you think it is local soakage? No, I think it must be springs; the supply never seems to alter in the driest season.

Strata.

5746. Do the wells on this station cost down? No; we sink in the solid rock.

5747. When you have touched the water, does it immediately flow into the excavation? Yes.

5748. How deep do you sink afterwards? The lowest we have gone down after striking water is 14 feet.

5749. And you were able to bale during the progress of the sinking? Yes.

Supply.

5750. Would that indicate the quantity of water you received into the well afterwards? Yes.

5751. Then you could pump your wells dry? Yes.

Size.

5752. What is the size of the wells? About 8 feet by 4 feet would be the average, 32 cubic feet to the foot.

5753. Do you ever find the well fail you? Never.

Supply.

5754. And do you think you could get an unlimited supply from the same source? We can only get that supply in about 4 miles of country—that is to say, 4 miles square.

Salt water.

5755. Have you any other kind of well? We have put down other wells, but we have always struck salt water.

5756. Did you ever attempt to get through the salt water? No.

5757. Have you had boring-machines on any part of your run? No.

Water supply improvement.

5758. Can you give us any other general information or suggestion for the improvement of the water supply in this part of the county of Culgoa? I may mention that near the boundary there is a small warrambool on the western bank of the Culgoa. In times of flood a slit cut from the end of the warrambool would convey water into the Nevine, and it would give a good supply of water for a considerable distance.

The Bourbon.

5759. Under other circumstances it is very dry in that part of the country? Yes; the Bourbon is a fine creek, but it very seldom runs; it is much better than the Culgoa, the Birrie, or the Narran, when the holes get filled.

5760. Would it be possible to close the Bourbon by one or two dams in its whole length? Yes; that is by putting down dams you would retain water. It would be a very great benefit.

Storage.

5761. As far as you know this creek, you think that if the water was held at a time of flood, it would remain for a considerable time and form a supply? Yes.

Soil.

5762. The ground is retentive? Yes.

Expenditure on water supply.

5763. In the management of so large a station as yours, what proportion of expenditure would be necessarily considered as set aside for water conservation? I could not give you any idea yet. I have only been among sheep for the last two years. A permanent supply ought to be worth about 15 per cent. on the general management.

5764. What would the general management expenses of the station be if it were fully stocked? About £10,000 a year.

Water-rate.

5765. If water could be supplied to the runholder, and if Trusts were formed for the management of water-works, do you think the lessees would pay a rate for the water? I think they would.

5766. The rate you name would pay interest on a large sum of money? Yes, it would. Perhaps I have given it a little too high.

Trusts.

5767. Suppose these works could be undertaken all over the country, and the country were divided into districts, you think the management of the work would be better in the hands of local Trusts? I think that if private people had the necessary legislation they would be willing to make their own dams.

Legislation.

5768. On what grounds do you think so? If you put up a dam you are liable to have it cut.

5769. You only want to be protected? Yes.

5770. And is the cutting of a dam the only thing you would fear? I suppose that under the new Land Law it would be the only thing to fear.

Tenure.

5771. If you had a more secure tenure you would make greater improvements? Yes.

5772. *Mr. Donkin.*] Had the people whose dams were cut on the Bokhara any redress? No.

5773. *Chairman.*] Perhaps under proper supervision no dams would have been placed there? I think not. On one occasion last year I myself helped to cut a dam on the Birrie. You mentioned boring-machines just now: I may say that a neighbour of mine has a machine at work; it is on the western side towards the Warrego River; Moulton Plains is the name of the station; they are down 128 feet, but have so far struck no water.

Boring-machines.

Strata.

5774. Do you know what strata they are passing through? I believe it is blue rock. It is a Wright and Edwards drill.

Tanks.

Well.

5775. Do you know what they are doing in other places for water—on the western boundary of your run? Most of the water they have is in tanks constructed similarly to my own. We have a well on the boundary, and they put down another well about 12 feet off. They went down 93 feet and got no water at all. We got water at 8 feet. The boundary line goes through the well.

5776. Is there much interest felt in this part of the country in efforts to conserve water? I have heard a great deal of it during the last three months.

5777.

5777. You think that these natural advantages, which we have seen day after day, have been well known to the lessees, but they could no avail themselves of them for the reasons you have stated? Yes. Mr. C. Mackenzie.

5778. They were perfectly well aware that they had these storing grounds, but they would not go to any expense under their former tenure? That had something to do with it, but I suppose there were other reasons. 20 May, 1885.

Mr. Evelyn Manning called in and examined:—

5779. *Chairman.*] What is the length of your experience in this district? Three and a half years. Mr. E. Manning.

5780. Concerning what radius of country, taking Brewarrina as the centre, can you give us information? I know Bokhara and the Birrie well; I also know the Bogan and the Marra. 20 May, 1885.

5781. How far down the Bogan do you know? About 80 miles down. The Bogan.

5782. You know the Bokhara well? I know it better than any other of the rivers. The Bokhara.

5783. It is generally stated that the Birrie River gives a better supply? The channel is a little lower. I have not ascertained it by level. The natural channel of the Birrie is a little lower. The Birrie.

5784. Do you know the nature of the country at the junction of the Bokhara with the Birrie? I do not know the actual character of the country there. Country.

5785. You know that they have made efforts on the Birrie to retain water by dam? Yes, small dams—overshots principally. Dams.

5786. Have you seen them? I have seen the best of them.

5787. Where is that? At Talawanta Station; it acts very well indeed.

5788. How many times have you known it to be entirely submerged by flood-waters? It was put up just before the drought; I think only twice. Submersion.

5789. Did you see the condition of the banks after the floods? No; I went to have a good look at the dam when it was just finished. Banks.

5790. You do not know then whether any disturbance of the bank took place? I do not think so.

5791. Are the banks like the banks of the river? No, the banks are very different; they are low banks, comparatively speaking.

5792. Is the material the same—is it likely to erode? The site was not selected on account of there being a harder material. The dams are placed at very narrow spots. All that they care about is the getting of the dam at the narrowest place, so as to cheapen the cost of construction. Position of dam.

5793. Do you know whether the people on the adjoining station object to this dam on the ground of overflow? I never heard of an overflow from one of the overshot dams. They are quite different from the earthen dams. Objections.

5794. They throw the water back a considerable distance? The Talawanta dam throws the water back 6 or 7 miles, if I recollect rightly. Back-water.

5795. It makes comparatively permanent water? Yes. Permanency.

5796. And, as far as you know, it is altogether a great advantage? Not only to the station itself, but to the station below. Advantage.

5797. In this flat country, where the creeks are so numerous, might not that principle be adopted on a very large scale? That is so. In my opinion it is the best means of conserving water for stock. I believe that a succession of overshot dams is the proper method of conserving the water in these creeks. An earthen dam is too large, and some of the water escapes over the country. The overshot dam keeps the water in its natural channel. Water conservation. Overshot dams.

5798. Do you know that they have placed earthen dams on the Bokhara, and that for their safety they have placed them higher than the banks of the creek? You must do that in the case of earthen dams, because if the water flows over the top the dam is carried away immediately. Construction.

5799. What is the result of building the dams in this fashion? As soon as the dam is filled the water spreads over the country, and eventually forms a new channel leading back into the river lower down the stream. A site is generally chosen where some natural channel exists. Results. Site.

5800. Do you know of any case in which the direction of a river has been changed by one of these obstructions? That took place on the Birrie at one point; there was a large earthen dam on the Milroy Run. The first flood cut a channel round it as large as the creek itself, and they had to make a dam in that also. Effect of obstruction.

5801. And in that case, had they adopted an overshot dam the channel would not have been disturbed? No. Overshot dams.

5802. The result would have been a good supply of permanent water? Yes. I think that in the worst of droughts the overshot dams would contain a certain amount of water, and would keep the beds of the creeks moist. They would thus prevent those great cracks which must otherwise occur. When a fresh comes down, it has not only to supply the channel but to pour millions of gallons down these huge cracks. Cracks.

5803. You have seen several floods? Yes, in the back creeks. I have seen only one flood in the Barwon. I have seen a couple of 30 feet rises in it, but they do not call that a flood here. Floods.

5804. Does that fill the Cato? About a 16 feet rise fills the Cato. The Cato.

5805. How far does it back up the Bokhara? That is more than I can say. Back-water.

5806. On the subsidence of the flood the Cato and the other creeks come back into the river? Yes; it is merely a billabong.

5807. You do not know of any effort being made to impound water in that creek? No. Impounding.

5808. And do you think it would be practicable? Yes, an enormous amount of water could be retained. The Cato has a fall from its mouth.

5809. The 30 feet rise in the river would give a 15 feet rise in the creek? Yes, more; because the bed of the river is lower than the entrance.

5810. Is there a bar at the entrance higher than the general bed of the creek? That is the case in all these lagoons. Bar.

5811. Do you know of any billabongs in the immediate neighbourhood of Brewarrina? There is the Tarrion, which runs out into flat. Billabongs. The Tarrion.

5812. There is a considerable body of water sent down there? Yes, but it requires a big flood to flood that creek. I do not know exactly where the Tarrion comes out—I think it is very nearly opposite the Cato. Supply.

5813. Would it be possible to deal with the Tarrion, as long as it remains a creek, so as to divert the flow over dry country? You could take it round the ridges into the flat country. It requires a high flood to fill the Tarrion—a flood which occurs only occasionally, say once in five years. Diversion.

5814. Supposing the water could be raised to the level of the Tarrion? I do not think you could do that. You could of course deepen the channel of the Tarrion.

5815.

Mr. E. Manning.

20 May, 1885.

Water conservation and irrigation.

5815. Is there not a bar there similar to that which is to be found on the Cato? No; it is a different sort of entrance; it does not come straight out of the bank—it flows round into a large flat, and afterwards forms into the creek.

5816. You think that the whole of this system of rivers is worthy our attention and examination, with a view to see in what manner they may be regulated, and by what means water may be retained? I do not believe you can irrigate the country out of them—there is not sufficient water coming down. As regards conservation, the only method would be by damming, either with earthen or overshot dams. The earthen dams would cause endless disturbance—there is always some fuss about these dams on these rivers. I think the immense volume of water which discharges into the Barwon could be retained by overshot dams, at least until the bed of the creek was filled. The surplus must of course escape.

The Marra. 5817. The Marra runs southerly from Collawarroy? Yes.

5818. Is it a well-defined creek? Yes.

Sectional area. 5819. What is the sectional area at the mouth? The banks would be about 15 feet high. It would be nearly 40 yards wide. It has a well-defined course. Generally on one side the banks rise straight, and on the other it is comparatively flat.

Floods. Discharge. 5820. At times of flood the waters of the Barwon would back into that creek, but with heavy local rains it would discharge freely into the Barwon? The Marra is the main channel of the Macquarie; it comes out of the Marshes.

Dams. 5821. Has anything been done in the way of damming on the Marra? Yes; there are earthen dams throughout.

Objections. 5822. And the same objection arose in regard to those dams as in regard to the dams on the Bokhara? Yes.

Effects. 5823. But they do retain water? Yes; you may say that they make it permanent.

Supply. 5824. And is the supply from the Macquarie Marshes sufficient to keep the dams full without causing any injury to the owners lower down? It has not run down for three years.

Sluices. 5825. And do you think that a more equitable arrangement for supply could be made if sluices were fixed in properly constructed dams? I think so. I think a succession of overshot dams would do all that is necessary. The place is particularly well suited to overshot dams; excellent sites could be found; within every mile you could find a suitable place.

Wings. By-washes. 5826. And the result of a perfect obstruction is to throw the water out into broad wings? They select places where a by-wash exists, and the water again finds its way into the river at a point lower down. The country is not so low as in the case of the creeks north of the Barwon; the out-spread is therefore not so great as in the Bokhara, &c.

5827. In undiminished quantity? Yes; I do not know of any case on the Marra where there is a long get-away.

Supply. 5828. If there were a fair supply coming down the Marra, and overshot dams were placed there, they would afford enough water for a permanent supply, and would give general satisfaction? I think so.

Dams on the Bokhara. 5829. Can you give us any other information? Only as to the Bokhara. If overshot dams were placed there I think all the bickering would cease, and that the stations would be just as well off as they are now.

Silt. The silt behind the first dam on the Bokhara has so raised the bed as to give an inordinate discharge into the Birie. The dams at the head of the Bokhara are very small.

5830. *Mr. M'Mordie.*] But they obstruct more water than overshot dams? Yes, of course, but the people do not consider that they are sufficiently close to the Birrie to warrant them in abstaining from that kind of

Site of dams. dam. My idea is that the dams should not be placed so close to the junction.

5831. If the first dam were put into the Bokhara under proper supervision we should get an equal supply, and the silting would not take place? Quite so.

Silt. 5832. Does much silting take place on the Marra Creek? I do not think so. It is all red soil. There is a good hard red bank.

Macquarie waters. 5833. No doubt in time of flood the Macquarie waters would find an uninterrupted course through the Marra Creek into the Barwon? Undoubtedly.

Cross-section. 5834. Have you ever taken the cross-sections of the Marra Creek? Never.

Length of the Tarrion. 5835. Do you know the length of the Tarrion Creek? Between 40 and 50 miles, I think. The good banks extend for a comparatively short distance.

Questions. 5836. *Mr. Donkin.*] Have you received a list of questions from the Commission? No, I have not.

5837. Would you be prepared to answer these questions gratis? Yes; I can answer any questions of the kind you indicate without charge.

5838. I ask because most of the licensed surveyors think they ought to be paid for it? I do not.

Mr. Ross R. Doyle called in and examined:—

Mr. R. R. Doyle.

20 May, 1885.

5839. *Chairman.*] What is your run? Weilmoringa; I have an interest in it.

5840. You have frontages to the Birrie and the Culgoa? Yes.

5841. And there is a good stream? It would not last more than three or four months unless it was

The Culgoa. Tail dams. dammed. We have put in tail dams; they are earthen dams, and they do very well.

5842. To what height have you built them above the bed of the creek? 4 feet.

5843. Supposing the water threatened to top your dam, have you by-washes or other means of saving the dam? It has to go away, and we stop the end of the next freshet. We ought to have overshot dams, but we have not had them yet.

Overshot dams. Cost. 5844. Are there overshot dams on the river? Yes, there are some below our run; they are very successful. I believe they cost over £300 each.

Width. 5845. Of what width are they? I suppose about 40 yards. Of course they are earthen wings.

Position. 5846. Are these dams placed in a shallow part of the creek? No; between two high banks. The wings are on the top of the banks; those of the overshot dams are below.

5847. Do you think these dams are better structures, although they cost more than the earthen dams repeated? Yes; if you put an earthen dam in the Birrie you stop all the water.

Series of dams. 5848. Could it not be repeated in the form of steps, so as to keep a continuous line of permanent water? I do not see why it should not be done.

The Birrie and the Bokhara. 5849. Is it not a fact that the Birrie has a better supply of water than the Bokhara? In one place I think the Birrie is 18 inches higher than the Bokhara. I do not know how to account for it, except it is owing to the silting up of the Bokhara by the construction of dams. I think the channel of the Birrie has been deepened to some extent by the operations of the Bokhara—but it was always a little deeper. There are

only

only three or four dams on the Birrie, and there are fourteen dams on the Bokhara. The first of the dams on the Bokhara thrust a lot of water out of the channel, and it is lost by absorption in the soil. Mr. R. R. Doyle.

5850. Do you think that a careful examination should be made with a view to the equalization of the discharge? Yes. 20 May, 1885.

5851. In the general management of stations, what would be the proportion of cost for water conservation? I can hardly answer that question—I should only guess. You might have a station with a good frontage. Expenditure for water conservation.

5852. What would it cost to afford a permanent supply of water for a 10-mile block? I should say about £4,000; that is if it were dry country without a frontage.

5853. *Mr. Barton.*] And it would cost you 5 per cent. to keep your supply clear of silt? Yes, fully.

5854. *Chairman.*] In view of that large supply, it seems to me that the pastoral tenants would be willing to pay a fair amount of money for the supply if they could depend upon it—by gravitation, for instance? Yes. Water rate.

5855. Supposing a general scheme of water conservation were carried out, with proper supervision and guidance, do you think the pastoral tenants would submit to a charge in proportion to the advantage? I should think they would be very glad to do it.

5856. What system of government for these local works would you think the best—ought they to be carried out by Trusts? I do not believe very much in Trusts—they neglect their duties. Trusts.

5857. Do you think we should get better attention under local management than if the works were managed by a Board in Sydney? I should think so. I should think a paid local Board would be best.

5858. Is the Bourbon Creek a reliable creek? Fairly so. The Bourbon.

5859. Are there any dams there? There is an earthen dam, but the by-wash has all carried away. Dams.

5860. If an inexpensive dam were designed for such places it would be a constant source of supply? Yes. Supply.

5861. What is the outlet of the Bourbon Creek to the Culgoa—does it widen out at all? It is about 40 yards wide; and a dam about 2 miles up from the outlet would give a large supply in a very dry part of the country. Outlet.

5862. Do you know the nature of the country from Eringonia down to Colless's station? I know it is a very dry country for 40 miles from Eringonia. Country.

5863. Does the water come down towards the Culgoa? It would take a very high flood to do so. I know that water does run down by Featherstonhaugh in the direction of the Culgoa, and that it would be a good part of the country for the use of boring machines. There are springs there. Flow of water. Springs.

5864. Do you think that the waters of the Narran can be diverted into the Narran? There are water-courses in that direction. In times of high flood I think you could bring the water anywhere you like. The country is very flat, but the water does run in that direction sometimes. Diversion of the Narran.

5865. Do you use the springs you have referred to? We use them to water about 20,000 sheep. The stone is hard and flinty; it is strongly impregnated with soda. Supply from Springs.

5866. *Mr. Barton.*] Can you suggest anything in the way of legislation, in reference to dams, to prevent persons from monopolizing the whole of the water; I suppose you have seen the evils of that? I have. It takes a big flood to run down the Bokhara, in consequence of the large dams which have been placed there. Legislation.

5867. Would it be advisable to legislate to prevent any one person at the head of the rivers monopolizing the whole of the water and draining it off to waste? I think that will have to be done.

5868. *Chairman.*] Do you think a system of dams, provided with regulating sluices, would be advisable? I should think so; I suppose the stream can be carried on in that way. System of dams.

5869. You think that would meet the difficulty? Yes; even the ordinary overshot dams would do that. Matters are getting serious now, and people are beginning to cut each other's dams.

5870. And the efforts of the Government to cause an inquiry into water conservation is favourably viewed by the pastoral tenants? I think so. It is the general wish to have some legislation with regard to dams. I may put up a dam either overshot or earthen, and any one of my neighbours may come next day and blow it up with dynamite. Water conservation inquiry.

5871. And the runholders would do as much as they could do in the conservation of water if they had a fair tenure of their property? Of course they would do more if they had a fair tenure; but I suppose they will have a fair tenure now. Tenure.

5872. *Mr. M'Mordie.*] If a large supply of water were stored in these rivers and creeks, do you think it would to any considerable extent be used for the growth of crops? I think so, to a slight extent. Crops.

5873. Do you think it would increase settlement and induce people to select land and settle down on small areas? I think it would under the present law. Settlement.

5874. Is it possible that this dry country can support any considerable population under the present state of affairs? I do not think so; it would be a very precarious mode of life.

5875. What is the cause of it? Scarcity of water.

5876. Therefore, if water were made available by storing it the difficulty would be removed, and there would be a tendency to increased population? Certainly.

5877. *Chairman.*] Do you not find that owing to the sparse population you have great difficulty in getting sufficient hands in the wool season? No, not much; we have to pay high wages. Labour.

5878. And if men settled on small areas they would be available for that purpose? Decidedly; at present we get the scum of the earth out in this direction in the wool season.

Mr. George Colless called in and examined:—

5879. *Chairman.*] You have been resident in this district for some years? Since May, 1850; I have been for the greater part of that time in the district. Mr. G. Colless.

5880. Are you settled here as a pastoralist? At the present time I am a conditional purchaser; I used to hold a run of 45,000 acres on the Culgoa. 20 May, 1885.

5881. You have seen the district in conditions of drought and fair seasons for a long period? Yes; in 1850–51 we had the most severe drought I have known. Seasons.

5882. You have also seen the country under severe flood. Yes. Floods.

5883. What is the condition of the country generally on the Culgoa and Barwon and their tributaries after the subsidence of floods—is the country generally supplied with water for any length of time? The water-holes in the courses are supplied, but there is no water back, except in such cases as the Cato and the Tarrion. Water supply.

5884. Do those creeks retain water—supposing there was a flood attaining a very high level, would it leave a large quantity of water in the creeks? In the Culgoa it would, but in the Birrie and the Bokhara they have to retain the water. The Ballonne maintains sufficient supply for the Narran and other creeks. Creeks.

5885.

Mr. G. Colless. 20 May, 1885.

5885. Local rains at the head of that river would keep these four rivers constantly running? Yes.

5886. So that there is more permanent supply than in the Barwon and other rivers? There is no river here except the Barwon which has a constant supply.

Back-water.

5887. These rivers in flood throw a quantity of water back on either side? I have seen it from this place to my place, on the Culgoa, 30 miles under water; I have gone in a boat from my place to within 2 miles of the 12-mile ridge.

12-mile ridge.

5888. In which direction is that from the Culgoa? About north-west, on the Warrego Road; it crosses Featherstonhaugh's run.

Dry lake.

5889. Are there any large billabongs in the back-water, or is it generally shallow? There is a kind of dry lake; there is no great depth of water; I have seen it run from the Warrego to the Lednappa; that is the drainage line.

Drainage line.

5890. Is not that a very dry portion of the country? Very dry.

The Warrego.

5891. And you think that it is possible that that water might be turned across there to keep up a constant supply? The Warrego is not as good a creek as the Culgoa; it would benefit the country between, but not the Culgoa. If you could make a canal it would be a great benefit.

Storage.

5892. Do you know of any large billabongs on the Barwon where large quantities of water could be stored during flood-time? Between here and Walgett there are billabongs which would store immense quantities of water.

Supply in the Barwon.

5893. If we stored large bodies of water like that, would it be of any benefit at any time? I have never known the Barwon to be dry; I saw it as a chain of waterholes in 1850–51; the longest distance I ever saw between two holes was a mile.

Current.

5894. If the river could be kept continually flowing would it not be a great benefit? I do not know.

5895. Would not the water become stagnant in the waterholes? I have seldom known the river to stop running; if you could send a supply of water down the river occasionally it would be a great advantage.

Dams on the Bokhara.

5896. You know that on the Bokhara they have dams fixed? I do.

Irrigation.

5897. Are they what is wanted? They are not high enough; if they were carried high enough they would irrigate all the surrounding country; a dam placed on the Tarrion would irrigate miles of country.

5898. If the water could be raised in that creek a dam would intercept it and throw it over a large area of country? Yes.

Country between the Culgoa and the Warrego. Tanks.

5899. You know the country between Colless's station on the Culgoa and the Warrego? Yes.

5900. How is it generally watered? By tanks.

Supply.

5901. You know of no creeks? There are none that I know of.

5902. And the only possibility of supplementing the water in the tanks would be by conserving water in the Warrego and pouring it across by artificial works? Yes.

5903. Is the country favourable for such works? Yes.

Government tanks.

5904. What are the tanks on a line from Colless's Crossing to Eringonia? There is a Government tank at Lednappa on the reserve; that is 35 miles from Eringonia; it is a very large tank; there is a clay-pan all around it, and it catches water very quickly.

Expenditure on water conservation.

5905. I suppose that, in the management of a station property, it is estimated that a large sum of money must be set apart for the watering of stock? Yes.

5906. What proportion of the cost of management would you set apart for it; supposing you spent £1,000, would it cost £400 of that for water? I estimate that it would cost £500 out of every £1,000, or about 50 per cent. of the cost of management.

Water rate.

5907. Supposing all these creeks were so controlled as to give a constant supply of water for this large area, would the runholders willingly pay for the advantage? I think they ought to pay for it; they ought to be very well satisfied to do so.

Loss of stock.

5908. In addition to the ascertained cost of works for water supply there has been a considerable loss of stock? There has.

5909. Owing to the absence of water? Yes. In the dry country on the Darling it is owing to the absence of grass.

5910. So that in a great measure the loss of stock must be added to the cost of obtaining water as far as they have gone? Yes.

5911. I suppose you know that the squatters have assisted themselves in a great measure in supplying water for their stations? Yes.

5912. And you know that the works have been somewhat faulty for want of proper information as to how to proceed with them? I think so.

Scheme for water supply.

5913. And you think that a carefully devised scheme for the supply of water would be less expensive to the squatter than what they are furnishing at their own hands? Yes, because it would water country which is of no use to them at the present time. I may say that about 15 miles west of Colless's station there are

Mud springs.

seven or eight mud springs all in a cluster; the mud blows up into mounds, and it is all charged with water; if you were to get on to the mud you would sink down a considerable distance.

5914. How do they get water from these places? A stockman on Runnawanna went out and tried to put a shaft down; he boxed it, but the mud burst the boxes; when they left it over night the mud would rise up inside.

5915. They never tried to extract the water by tubes? No.

5916. Do they use the water in any way now? There is one place in which it can be used, but there is no great quantity; it is good water; there is always a small supply on the top of one of the hummocks, but it is of no use to any one.

Wells.

5917. Have they tried to sink wells in the neighbourhood of these mud springs? They have not; I intended to do so when I leased the land, but I sold it to Crosse and Featherstonhaugh; I believe that a well has been sunk at the saw-mill since I left the place, and that a fair supply of very good water has been obtained.

Dams on the Birrie.

5918. You have seen overshot dams on the Birrie? I have not; all the dams that I have seen made were on the top of the bank, and the water used to run around them and form a second creek.

Water conservation.

5919. Do you think that the people in this district would take a lively interest in any movement in the direction of water conservation? I do.

5920. And that they would support the Government in the matter? Decidedly; it would be to their benefit to do so, as where they carry a beast now they would carry ten if the country were irrigated—that is, if it were watered sufficiently for the growth of grass.

Station people.

5921. Are the people on the stations here generally principals or managers? Principals.

5922.

5922. You know they have made great efforts to assist themselves in the matter of water conservation wherever possible? Yes. Mr. G. Colless.

5923. Have they done so to the extent to which they might have gone? Not all. 20 May, 1885.

5924. Is there any particular reason why they should not do so? In many cases I fancy that they have not done so owing to the want of money.

5925. You think that they would not hesitate to spend more money if they could spare it for the purpose? I do not think they would.

5926. Have you any other general information which you think would be of service to the Commission? In most instances, on these rivers at all events, the back country is always lower than the country on the banks; I have noticed this. Fall of country.

5927. From that we may infer that cuttings made through the banks of the rivers would discharge water into the country behind? Yes. Diversion of water.

5928. Suppose we carried water through the banks of the rivers into the country beyond, would it be beneficial to use the water in that way? I think that it would be of the greatest benefit; I could mention many places which would be greatly benefited by it.

5929. Do you know of any creeks which by a little improvement could be made to convey water better than they do now? I do not think that it would be of much benefit, except in the case of the Barwon, and you do not want to shorten that. Improvements.

5930. *Mr. M'Mordie.*] If large quantities of water were stored in the rivers, creeks, and natural basins, would it be used to any great extent for the growth of crops? It could be used to great advantage in that way, but I do not think that it would be so used. Crops.

5931. Do you think that it would be profitably used? I do.

5932. In that case, do you think that selection, and therefore population, would be increased? No doubt they would. Population.

5933. And that the land would be made very much more valuable? It certainly would. Value of land.

5934. What would be the value of irrigated land, as compared with non-irrigated land? There is a great difference between the two; I should think that you could not grow a ton of hay on 100 acres now, but with irrigation you could grow what you liked.

5935. What would the water be worth for irrigation per acre per year? I do not know what other people would value it at; I should value it a great deal myself; I should not go in very largely for agriculture, but I should irrigate 100 acres if I could get the water, and I should not care much what I paid for it. Irrigation.

5936. Would it be worth £2 or 30s. per acre? It would not be worth £2; I do not know what they would do with produce in this part of the country; I would willingly pay £1 per acre, but I would not pay 30s.

5937. You think that it would increase settlement? It would if the land were properly irrigated; I think there is no doubt that there would be a large number of settlers in this part of the country. Settlement.

5938. Is it possible under the present state of affairs, in ordinary seasons, that this district can be populated? No.

5939. The country cannot be profitably occupied? Unless by squatters. With water it would support a large population. One year I had an acre of land under oats, and I got 3 tons of hay off it; that was in a favourable season; I have tried in other seasons since, but have not got anything.

5940. I suppose you know that on this river they are, by means of irrigation, growing a series of crops? Crops of pumpkins, cabbages, and potatoes are grown by Chinamen. Crops.

5941. You are sure that water is the agent required to produce payable results? It is.

5942. If such works as I have indicated were carried out, what system of management would be best for their maintenance, with a view to their being made to suit the requirements of the people in the districts? I should think that local Boards would be best; unless something is done to store the water the country cannot be occupied. Trusts.

Mr. Thomas Baird called in and examined:—

5943. *Chairman.*] You are a resident of Dubbo? Yes, about 2 miles out of Dubbo, on the opposite side of the Macquarie. Mr. T. Baird.

5944. Are you engaged in pastoral pursuits there? Yes. 20 May, 1885.

5945. I suppose you are well acquainted with the Macquarie River? Yes. The Macquarie.

5946. You have seen it in flood? Yes. Floods.

5947. And you know the results? Yes; I have seen it go all over the low country to the north of Dubbo, and all over the flats about the town.

5948. When the floods subside there, does the water run off very quickly? Yes.

5949. And the neighbouring creeks are well charged with water? Yes.

5950. You suffer no inconvenience in regard to stock? We have to be careful just about the angles of the river.

5951. What is the nature of the Talbragar? It is a very deep and wide creek. The Talbragar.

5952. I suppose the whole of the frontage to that creek is suited to pastoral and agricultural purposes? It is more adapted to agricultural than pastoral purposes. When you get up about 30 miles there is a really good agricultural district. Frontage.

5953. Have any measures been taken for the storing of water on that creek? No; it is very badly off in that way. Storage.

5954. Nothing has been done in the way of overshot dams? Not as far as I know. Dams.

5955. Is there any local objection to it? I do not know.

5956. Why have they not assisted themselves in that way? I suppose they have made dams on the back creeks and swamps.

5957. Does the creek discharge into the Macquarie? Yes; it is almost as deep as the Macquarie at the point of entrance. The water is sluggish in its discharge, and any obstruction in the shape of low-level dams is not likely to be removed by the velocity of the stream. Discharge current.

5958. How far would the water arrested by a weir go back? In some cases 7 or 8 miles. Back-water.

5959. You are aware that nothing of that sort has been done? Yes, nothing has been done.

5960. Could a system be devised for the shutting off of the water by overshot dams, and would it be beneficial for agricultural and other purposes? I think so. It is very dry country. You can get water by going down under the surface. Overshot dams. Underground supply.

5961.

Mr. T. Baird. 5961. Is the soil on the creeks retentive? No; it is rather of a sandy nature.

20 May, 1885. 5962. But you do not think that the flow of the creek arrested by steps would bring down any large quantity of silt? No; at the head of the Talbragar there are large waterholes in which there is no silt.

Silt. The silt is washed in from the surface drainage at intermediate places on the course.

5963. Do you think it would be deposited in such quantities as to nullify the advantage of the water? I should think so, in course of time; but it would take a long while.

5964. There are a great many tributaries to the Macquarie, and the information you have given would apply to most of these in level country? It would.

Height of banks. 5965. Do you think that from a succession of deposits in floods the banks have been raised above the back country on either side? I could not say. There are some very fine alluvial flats on the side of the Talbragar, but they have not been tested in regard to level.

Diversion. 5966. Could places be found on the banks from which, by the making of cuttings, water could be taken on to the back country? I believe such places could be found, but the plains are not very extensive.

5967. Higher up the creek there might be an increased declivity in the bed? Yes.

5968. And there we should get a head of water by gravitation to irrigate the plains below? Yes.

The Macquarie. 5969. Has any attempt been made on the main river of the Macquarie to dam or retain the water? No, I am sure not.

Fall. 5970. There is a small fall? Yes, after it passes Wellington.

Bars. 5971. You do not know of any natural obstruction existing in the river in the way of a bar of rock, or anything to indicate what would be the result of placing a dam across it? No; but there is a bar of rock about 30 miles below Dubbo, as the crow flies.

5972. Does it raise the water above the average level? You cannot see much difference.

Waterhole. 5973. Is there a pool of water above that obstruction? There is a waterhole.

Silt. 5974. It is not silted up? No; although in all waterholes on the Macquarie there are signs of silt.

5975. You know the course of the river to Warren? Yes.

5976. Do you know it as far as the Marshes? Yes.

Banks. 5977. How far does the river continue in deep banks towards the swamps? To about Growhay.

Waste in the swamp. 5978. In your opinion, is a great quantity of the Macquarie water wasted in the swamp? A great deal of it.

Value of country. 5979. Do you know the value of the country between the points mentioned, and from thence across to the Bogan? Yes.

Creeks. 5980. There are several creeks there? Yes.

Fall towards the Bogan. 5981. Is there any indication of a fall from the Macquarie to the Bogan? Yes; the water runs from the Macquarie all above Warren and goes into the Bogan.

Interception. 5982. Could you take a drainage line from the Macquarie to the Bogan and intercept the whole of these creeks? I think you might.

5983. By so doing we should put into an impermeable channel a great quantity of water now wasted in the Macquarie swamp? Yes.

5984. Do you think that the work would justify the Commission in making a closer examination in the way of levels? I think so—decidedly.

Nature of country. 5985. What is the nature of the country at this point on the Macquarie? There are good banks.

Diversion. 5986. And if a weir were made to resist the pressure of sudden flood the water could be diverted for useful purposes? Yes.

The Castlereagh. 5987. Do you know the Castlereagh? Yes.

Creeks. 5988. There are a number of creeks running between the Castlereagh and the Macquarie? Yes.

The Marshes. 5989. The Macquarie runs through the Marshes, but it is very ill defined? You would not know you were passing it. No one could swear to the main channel.

The Castlereagh. 5990. The Castlereagh is also a river of some importance: it seems to die out as it approaches the Barwon? It is a much better river to dam after it passes Coonamble than it is above, because the sand seems to cease there. From Coonamble down towards the Barwon there is the same flat country as that we have been speaking of, and it might be treated in the same way by overshot dams and weirs. I have no doubt that a dam placed across the Castlereagh above Coonamble would be very quickly silted.

Width. 5991. What is the average width of the Castlereagh above Coonamble? The average is considerably over 100 yards.

Depth. 5992. What would be the depth? In many places from 15 to 20 feet deep.

Water rate. 5993. Do you think that, if a properly devised scheme of water conservation were adopted, the agricultural and pastoral tenants would submit to the payment of a rate for water according to the quantity they required? I should think they ought to. Travelling stock can hardly pass at times for want of water.

Water conservation. 5994. Do the pastoral tenants now assist themselves in a great measure in the conservation of water? Yes, on the out creeks, away from the Castlereagh.

Dams. 5995. What means do they adopt? Earthen dams.

5996. But they are liable to be washed away? Yes.

5997. If a more permanent structure could be put in at an enhanced cost, would it not be better than these temporary works? Undoubtedly it would be much better.

Trusts. 5998. What system of supervision would you consider most practicable, supposing works of conservation were generally established—should they be managed by a Board in Sydney, or should there be local management? I should think local management, if there were good men, because they could soon be upon any spot to see what was required.

Crops. 5999. Is there much growth of cereals in your district? Not much; they have been at such a low price that the farmers have got sick of growing them. A great many grow hay, but they have not stored a large quantity. I think they are doing so more than formerly, especially with lucerne.

Irrigation. 6000. What is the result, as far as you know, of irrigation? It has yielded about 150 per cent. more than the same soil would yield in an ordinary season.

Legislation. 6001. *Mr. Barton.*] Do you think that there is a necessity for some legislation with reference to the damming of creeks and rivers? I think so. People are almost afraid to dam in many rivers lest their dams should be cut away; they say that if I preserve water my neighbours below will cut away the dam.

System of dams. 6002. Which do you consider the best system of dam, the earthen or the overshot? If you could get the overshot dams to stand I think they would be the best. My experience is that the water cuts round the ends.

ends. I have found the earthen dams the best, throwing the water off, and letting it find its way back again lower down into the main channel of the river. Mr. T. Baird.

6003. *Mr. M'Mordie.*] In the case of these large earthen dams which send the water over the country, is it not fair that the people below should have the right to cut them? If they all made dams they would all have water. There is always sufficient water coming down to supply the whole of the dams. 20 May, 1885. Supply of dams.

6004. If each dam drained water into the country 5 or 6 miles, would there be sufficient to supply the people at the lower end? Yes, because there are billabongs and swamps to bring the water back again into the main channel of the river.

6005. *Mr. Barton.*] And will not the floods occur more often as the country gets stocked and trodden down? Of course—there can be no doubt of it. The sheep pads harden the ground, and the cattle pads make natural channels to conduct the rains into the rivers. Frequency of floods.

6006. *Chairman.*] In legislating for continuous dams, would it not be an advantage if you could regulate the balance down the river? Yes.

SATURDAY, 23 *MAY*, 1885.

At Bourke.

Present:—

MR. BARTON, M.P., | MR. LYNE, M.P.,
MR. FRANKLIN, C.E., | MR. M'MORDIE, M.I.C.E.,
MR. MURRAY, M.P.

W. J. LYNE, Esq., M.P., PRESIDENT, IN THE CHAIR.

Mr. Charles S. Chauncy called in and examined:—

6007. *President.*] You are a licensed surveyor? Yes. Mr. C. S. Chauncy.

6008. How long have you been in this district? Getting on for four months.

6009. Where have you been employed during that time? In the county of Irrara. 23 May, 1885.

6010. Have you been making surveys there? Yes; measuring improvement purchases, dams, and tanks.

6011. Will you specify any dams? Yes; the best dams I have seen are those shown on this map. One is the Kirribie dam, in the county of Kirribie. There are tanks sunk on each side of it, and there have been between 11,000 and 12,000 yards of excavation on each side, above and below it. Dams.

6012. Above and below it in the creek? Yes.

6013. What is the effect of that in storing water? A dam about a mile below backs the water right up to it, and fills the tank on the lower side. Back-water.

6014. There is another dam—how far down? About a mile.

6015. And that dam backs the water up to the banks on the lower side of the upper dam? Yes.

6016. Then the country is very flat? Yes. Country.

6017. What is the fall? I could not say; I never tried. Fall.

6018. Is there a rock there? Yes, there are rocky sides—a kind of limestone. There is a by-wash on the southern side cut out of the rock. Rocks.

6019. Is there any rock in the bed of the creek? Yes.

6020. Is the dam built on rock? I could not say. It is full of water, but I think it is further down the creek. Where there is no water there are ridges of rock right across the creek.

6021. And are these places where ridges of rock go across generally selected as the sites of dams? Yes, as the creek is narrow there, of course the dams hold better. Sites of dams.

6022. What height is this dam? About 25 feet. There is over 20 feet of water in it. Height.

6023. But is it 25 feet higher than the bed of the creek or than the bottom of the bank? The bed of the creek.

6024. Then there must be some 20 feet of water if it is full? I do not know how near the excavation is to the dam, but I believe there is 20 feet in the dam without the excavation.

6025. Then it is not running over now? No, not at present, but it is full.

6026. What length of by-wash has it? About half a chain; it lies just over the bed of rock. By-wash.

6027. Where it falls off the rock into the creek, does it fall on to rock? Yes, on to rock; on a rocky bed right into the creek.

6028. Then there is no chance of wash? No; the dam is banked up to the by-wash with large boulders.

6029. Is that at the lower side? On the south wing,

6030. What length is the dam? It is about 2½ chains. Length of dam.

6031. What thickness? It is about 25 feet on the top, and it has a great batter. I do not know what it is at the bottom. Thickness.

6032. Is there more batter on the lower than on the upper side, or is it the same on each side? I think it is about the same. It is full of water, and I could not judge very well. Batter.

6033. Do you know whether it was made in the ordinary way by carting earth? Yes, I think so.

6034. There was no puddling? I do not think so. Puddling.

6035. How long has it been there? Since 1874. I think it was completed in 1875.

6036. And there have been heavy floods since? Yes.

6037. And has the dam ever given in any way? No. Solidity.

6038. Has there been permanent water? Yes.

6039. How far does it dam the water back? About 2½ miles. Back-water.

6040. Is the country level away from the creek? There is a very fair fall of perhaps 10 chains into the creek, and then it is quite level. Country.

6041. And what about the other dam below? There is more earthwork there, and I believe it is an almost equally good dam. It is a much longer dam; I should think it is 6 chains long. Longer dam.

6042. And how is the by-wash made? The by-wash is about 4 chains long, and runs over rock. By-wash.

6043. Do you know of any dam where the by-wash is not cut out of the rock? Yes; I know the Multagoona dam, on the Irrara Creek.

6044. Do these dams back the water from any ana-branches? No; there are no ana-branches.

6045. Are there any dams below the second one you spoke of? There is another one, but it is not of great importance, about a mile and a half further down. Other dam.

6046.

Mr. C. S. Chauncy. 23 May, 1885.

6046. Is that built in the same way? It is built in the same way, but it is much smaller.

6047. Is the by-wash through rock? I could not say. The by-wash runs out, but the soil is not washed away much; it has a stony bottom.

Width of water. 6048. What width of water is generally backed up by these dams—a broad or narrow sheet? The water is about 3 chains wide at the lower dam.

6049. And what about the upper dam? The water is about 3 chains wide there, and it gets narrower half a mile above the dam, and then opens out again into shallower and broader water.

Depth. 6050. About what depth is that shallower water? I should think about 10 feet deep. Between half a mile and a mile above the dam the water is shallower.

6051. What is the depth lower down? I believe it is from 15 to 20 feet close to the dam and within half a mile of it.

Rise. 6052. How near the top of the dam does the water rise? Within 6 feet.

6053. Is that the case in the two dams? In both of them; in the lower dam it may be only 5 feet when the water is full, and 6 feet in the upper dam; I noticed it particularly the other day.

Multagoona dam. 6054. What height is the Multagoona dam, the one with the by-wash of earth? It is 4 or 5 feet high; it is a very long dam, about 8 chains long.

Excavation. 6055. And is there an excavation above it? Yes; and the earth from the excavation is used for banking up the dam.

Depth. 6056. What depth is the excavation? I do not know; it was full of water and running over.

Thickness of dam. 6057. What thickness is the dam? I should think that on the top it is 5 or 6 feet.

Batter. 6058. And does it go away with a great batter? With a batter of one and a half to one.

By-wash. 6059. What sort of a by-wash is there? A very bad one; the water just runs round the end of the dam, and they have to keep repairing it, for fear the dam should wash away.

6060. Is the surface disturbed where the by-wash is, or does the water simply flow over the surface? It has been made to flow over the surface, and it has washed the earth into holes.

Channel. 6061. Has it made a channel? Yes.

Repairs. 6062. And how is it repaired after each flood? By throwing in more earth and bringing the channel further round.

6063. By lengthening the dam? Yes, as far as I could see, that is the way it has been done; there are two or three big trees with large roots which I think serve to keep the earth from washing away to some extent.

Stability. 6064. That dam has withstood floods? Yes, it has had floods over it, but I do not think there is a very straight run of water there.

By-wash. 6065. But, as a rule, the by-wash is always cut out of rock? Yes, wherever it can be done.

6066. And where that is not done, and the water is allowed to flow over the surface, there is a difficulty in keeping them clear? Yes.

Dam on Warrego. 6067. Do you know of any other dam? I know another dam on the Warrego at Pirillie; that is a dam which must be from 10 to 12 chains long.

Height and width. 6068. And what height and what width? I have only driven over it and have not examined it particularly, but there has been a lot of earth used in its formation; it is a very large dam—you could drive a wheeled vehicle over it.

Batter. 6069. Has it a good batter? Yes.

Depth. 6070. What depth of water is there above it? I do not know, but it is very deep and permanent.

Back-water. 6071. Does the dam back the water far along the creek? To the next dam about 4 or 5 miles away; there is good water all the way.

By-wash. 6072. What sort of by-wash has that dam? It has a by-wash that comes round, I should think, half a mile; and at the furthest point, I should think, it is a quarter of a mile away from the dam; it has formed a channel of its own and runs right away from the dam altogether.

6073. Is it washing away? I do not think so; it has formed a channel 40 feet wide.

Soil. 6074. What is the nature of the soil? It is a sort of clay, very similar to the soil about Bourke.

Stream. 6075. Is there any great rush of water? Yes, there is a good stream running when the water is high.

6076. From that it would appear that it is not impossible to make a dam that will stand without being built on a reef of rock? No, that dam has been erected for twelve years I believe, and it is one of the best in the Warrego.

Lake Denman. 6077. Do you know anything of the lake on the Kirribree River? Lake Denman; it is about 2 miles long and nearly round; it is about a mile and a half from Kirribie Creek.

Supply. 6078. How is that lake fed? It is fed by local rains.

6079. Not from the river? No, except in very high floods; a dam on the Kirribie Creek throws the water across a plain, and they have made a small embankment and a canal to throw the water back into the lake.

6080. That is from Kirribie Creek? Yes.

6081. Then it is fed from Kirribie Creek? Yes, in high flood.

Depth. 6082. What depth of water is there in the lake? Not more than 6 feet.

6083. How long does it last? I believe it was just dry during the last drought.

6084. Does 6 feet of water last through a three years' drought? It is not nearly full now.

6085. When it is full, about what depth of water would there be? About 12 feet I should think.

Ground. 6086. It is good holding ground I suppose? Yes.

Mud spring. 6087. Do you know anything of a mud spring at Coonbillie? Yes.

6088. Describe it, will you? There are several of them; they are on the south-east corner of the Coonbillie block; the water is at present oozing out of the mud, and the mud is banked up about 3 feet high in places; it seems to have been forced up by the water.

Appearance 6089. Has it the appearance of a cone cut off about 3 feet above the surface of the ground? Yes; there is a hole in the centre, and pure water right up to the surface.

Permanency. 6090. Are those springs permanent? I believe so.

Well. 6091. No bores have been sunk near them to ascertain if the water would flow over the surface? A well has been dug about 10 chains from the spring, at a 10 feet higher slope, out of which water was obtained,

Quality. but I believe it is only fit for stock; the water in the spring is very good.

6092. Then the water in the well is not the same as the water in the spring? No.

Fence. 6093. Is the spring fenced in? There is a brush fence round it; there are about 10,000 stock at it.

Stock watering 6094. How are they supplied with water? The water is in some places out of the spring and in holes.

6095. Does it trickle over and run into holes? Yes.

6096. Is it not run into troughs? No, there are small holes near the spring full of water. Mr. C. S. Chauncy.
6097. *Mr. Barton.*] Is that the only spring you know anything about? Yes.
6098. How do you get at the depth of the water in the Denman Lake? Only from information I have received. 23 May, 1885.
6099. And why do you suppose it would hold 6 feet more? From the appearance of the bank; I could see where the water had been up to when the lake was full. Denman Lake.
6100. *President.*] Where were you working before you were employed on the Warrego? In the county of Rous, then in the Metropolitan district; the county of Rous is on the Richmond River, on the north-east coast.
6101. Did you see any places on the Warrego or the Darling where there were reefs of rock that could be utilized in building dams? No; I have never been along the Darling, and I have never seen any on the Warrego. Reefs of rock.
6102. *Mr. Franklin.*] Have you seen any timber-constructed overshot dams? No, I have not.

Mr. J. T. Gibson called in and examined:—

6103. *President.*] What is your occupation? I am a wool-scourer near Bourke. Mr. J. T. Gibson.
6104. How long have you resided there? Four years.
6105. You have erected a wool-scouring plant and pumping machinery, have you not? Yes; the pumps supply the water for wool-scouring. 23 May, 1885.
6106. You have enclosed some ground for a fruit and vegetable garden, and you have utilized the water which you pump from the river to water it? Yes; we let the water run through the garden during the meal hours. Irrigation of garden.
6107. Is the water pumped directly from the river? Yes. Pumping.
6108. And what has been the effect of the irrigation? About three years ago we got some young fruit trees from Sydney, and now they have grown to a very large size; the peach trees are 10 or 11 feet high. Effect.
6109. Will you describe the growth of some of the trees? There are two peach trees 1 foot 7 inches round, a lemon tree 11 inches, and one orange tree about the same size as the lemon tree. There is also a small fig tree 7 feet high, which was just a sucker last year and put into the ground. We also got five seeds of Mexican grass from Baron von Mueller, three of which I put into the ground last December and now the grass is 10 or 11 feet high. Mexican grass.
6110. And what is the area covered by the grass? About 14 yards; the grass grows out from the bottom. Area of grass.
6111. What is it useful for? It is useful as fodder for horses—the horses are very fond of it. Use.
6112. You have not tried anything else with it? No.
6113. And everything else in the garden I suppose has grown proportionately? Yes.
6114. You have everything in abundance? Yes; I believe we could grow almost anything there.
6115. During the time you have had that garden what sort of seasons have you had—good ones? No, they have not been at all good lately. Seasons.
6116. And where water has not been used what has been the result? Nothing has grown—the ground is quite bare.
6117. Have the fruit trees borne well? Yes; last year a lot of peach trees were broken by the weight of the fruit. Fruit trees.
6118. And at the present time have you any oranges or lemons? Yes, I have a fair supply.
6119. *Mr. Barton.*] Have you any idea of the quantity of water it would take to water a given area? I could hardly say; I fancy about 1,000 gallons a day on an average have been used at my place. Quantity of water used.
6120. Over how much ground? About 2 acres I should think. In the summer-time we use more—in the winter, less; in the winter we only water occasionally.
6121. *President.*] Your garden is situated on the bank of the Darling, is it not? Yes. Situation.
6122. And the water is pumped up from the river? Yes, by Tangye pumps. Pumps.
6123. *Mr. Franklin.*] What means have you of distributing the water? We run it over the surface in trenches, and flood the beds. Distribution.
6124. Have you attempted to make watercourses, by raising the ground and cutting trenches in the raised banks? No. Raised trenches.
6125. Do you think you could consolidate the earth so as to make it impermeable and cut your trenches in it? I believe we could; in the Chinamen's garden they have raised trenches.
6126. You spoke of a new kind of fodder you have grown from single seeds: can you give anything like the approximate weight of the growth from these seeds? No. Fodder.
6127. Can you roughly estimate what the whole of it would weigh if you cut it down? I fancy it would be more than a man could carry.
6128. Then would you estimate it at 2 cwt.? I dare say it would be between 2 and 3 cwt. Weight.
6129. That is 1 cwt. per seed: what area of ground would that occupy? The seeds would require to be in drills 6 feet apart, and the seeds themselves 3 feet apart. Seeds.
6130. And what area of ground would these three seeds cover? About 2 square yards to each seed. Area.
6131. Then this weight of 3 cwt. of fodder only covers 6 square yards? Yes.
6132. So that upon that basis we could calculate what an acre would grow? Yes.
6133. *Mr. Barton.*] Does the plant seed with you? It is in seed now; I intend to plant another patch next year. Seed.
6134. *Mr. Franklin.*] You pump the water directly from the river? Yes. Pumping.
6135. Have you found the river too low to operate on it? No.
6136. Is the river always flowing past your place? Yes. River flowing.
6137. And is it continuous down the river past your place? Yes.
6138. It is not in waterholes? No, it has never been in waterholes since I came here; about a mile and a half below there is a ridge of rocks across the river, and the river is always running over it. Waterholes. Rocks.
6139. Do you know if it has caused any inconvenience to the people on the river for watering stock or other purposes by its being so low? I do not think so; I think there has always been sufficient water for watering stock: the only inconvenience that might have been felt has been from its getting shallow and the stock crossing and re-crossing. Water for stock.
6140. Has this low state been the cause of the loss of stock by bogging? Yes. 6141. Bogging.

Mr. J. T. Gibson. 23 May, 1885.

6141. And you think that if the river could be kept at a moderate level it would be beneficial for watering stock? I think so.

Machinery for irrigation.

6142. *Mr. Murray.*] You simply utilize your machinery for irrigation when it is not in use for wool-washing; but do you think it would pay to have machinery for the purpose of pumping up and irrigating alone? I think it would pay to irrigate the ground for green stuff for horses.

Banks.

6143. Do the banks of the river consist of good soil? Very good on the high parts.

6144. Capable of producing anything I suppose? Yes, if there is plenty of water.

6445. The banks of the river are good retaining soil; there would not be much difficulty in the way of making dams in the river at Bourke? In some places there would.

Escape of water.

6146. Why? I think the bank is porous; there are holes cut through. Before I came to Bourke I lived further down the river, on a station, about 600 miles away, and I made a dam across the creek, but the water all got away through the soil—not over the dam nor under it.

6147. *President.*] Did you ever try to ascertain whether the water percolated through the soil? I gave it a trial, but no more.

Dams in Darling.

6148. Do you consider that a dam could be made in the Darling, or in any of the branches of the Darling where there was no reef of rock? Yes: I do not say that the soil is porous at every place—I think you could find places where it would be sufficiently good for a dam.

Reefs of rocks.

6149. Do you know of any reefs of rock? Yes, there are great many below here.

6150. And if a dam were made at one of these reefs sufficiently strong to stand, would it hold the water? Yes, so long as it had a good by-wash.

By-wash.

6151. Do you think a by-wash would stand unless hewn out of rock? Yes, if you got a good long billabong.

6152. But suppose you utilized the natural channel and let the water go out above the dam, do you think that would in time of flood wash into as large a channel as the river bed? It would depend on the outlet; if it were low it would take a long time, but if it were high it would sooner cut.

Dams.

6153. But from your knowledge of the Darling for some years, you think it is practicable to put dams across the river and dam the water at certain selected spots? I think so.

Fodder.

6154. *Mr. Franklin.*] What is the nature of the fodder that you spoke about? It is something like maize or sorghum; the seeds are very small, like oats with the two sharp ends cut off.

6155. Do you know if stock generally will take it as food? Our horses eat it, and cattle also will eat it.

6156. Is it growing on the average soil of the banks of the river? Yes, on the high places.

6157. I suppose it would not grow on flooded ground? I could not say.

6158. You say it would produce at the rate of 1 cwt. to 2 square yards on the average soil of this district? I think so, if it got sufficient water.

6159. Then it would produce 120 tons of artificial food per acre? Yes; it is the best growing fodder plant I ever saw.

6160. Do you know any other people who are growing it? No; I think only a few seeds came to Bourke.

Mr. J. J. Higgins called in and examined:—

Mr. J. J. Higgins. 23 May, 1885.

6161. *President.*] You live somewhere near the Paroo River? Yes, I am employed there as a licensed surveyor.

6162. How long have you been out there? About two years and a half.

The Paroo.

6163. I want your evidence in the first instance about the Paroo River: what is the nature of the country on that river about the watercourse? In common with most rivers with a westerly course the Paroo widens as its length increases, and disappears eventually in the plain, generally forming a large shallow lake, and the water remains in that lake a longer or shorter time.

Bed.

Lake.

6164. Where does the lake form? Near Tonga, about 70 miles above Wilcannia. That locality would represent the lake formed by the Paroo flood-waters, the same formation that exists in the other rivers.

Size.

6165. What size does the lake form? It is a system; if it were full it would probably be 40 miles by about 15.

6166. That is the overflow from the Paroo? Yes.

Floods.

6167. And that country is nearly covered when the river is in flood? Exactly; it is filled when there is an unusual quantity of water.

6168. Have you any idea of the length of time the water remains there after a flood? In the deeper part of the depression the water would probably last, I think I am justified in saying, eighteen months or two years, but very much would depend on the seasons.

6169. What is the depth of the deeper part? I could not accurately say; I should think about 13 feet.

Evaporation and soakage.

6170. Do you think that the water goes away principally by evaporation or by soakage? A great deal of it must disappear by evaporation; but that subject seems to be so little understood that I could not give a definite opinion; the best authorities seem to know but little about the matter.

Formation.

6171. What is the nature of the country where the system forms—the nature of the soil? It is a lacustrine deposit overlying an impure limestone of compacted strata, or a cemented sandstone, whichever you will. It consists of disintegrated portions of quartzose rocks cemented together by a deposition from foraminifera associated with purer limestone. That is my definition of it, if I am to go into technicalities; it is the only description I can give as a technical one.

Porosity.

6172. Is the material porous? It depends altogether upon the depth and the pressure to which it has been subjected. At a great depth under great pressure it becomes solidified and will become almost marble, according to the purity of the limestone, or it will become sandstone if lime is absent. If sandstone it will be more or less porous, like all sandstones. If the proportion of lime or foraminifera shell is greater, then it becomes a compacted limestone and impervious to water; and all the conditions between the two obtain in this underground stratum; it is a cretaceous formation.

6173. Do you know of any instances in which sinking for water has been carried on in that country, either by boring or sinking wells? Yes—both.

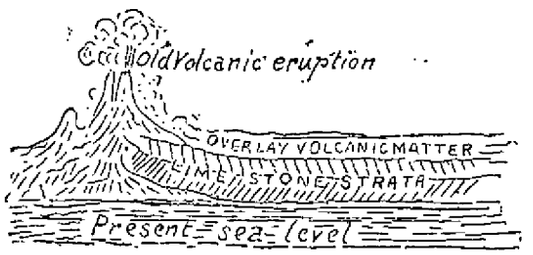
6174. Will you give the Commission any particulars you can? I have not taken any notes; I can only give my impression of the country as I saw it.

6175. Will you describe those you are acquainted with as well as you can, and define their position as nearly as possible on the map? Before I saw the country I was aware from Mr. Clarke's writings on the subject of the supposed existence of an underground drift; and, broadly speaking, from the volcanic upheaval

Structure of country.

upheaval of the main range of the Colony; the particles of disintegrated plutonic rock have been washed into water—probably a shallow sea—and carried about and distributed levelly by the ocean currents that obtained in that sea. That is apparent as you go out over the black-soil plains—the Liverpool Plains and others; you can see that they have been levelled by water, and that they consist almost solely of plutonic matter, identical with the plutonic rocks in the mountains forming their watershed. This ceases somewhere about the Bourke district, or to the eastward of it; you then get into limestone formations, where the plutonic matter is not carried quite so far. The system of plains is more to the eastward, and as you come westerly from the main range you lose that plutonic matter in coming to the limestone formation, and the limestone formation becomes visible under it. The limestone formation is carried a long way—how far I do not know. It has been part of an older system, and has been thrust up and disturbed by the volcanic agencies of the higher mountains. Now we will find it go off somewhere—where it does not matter—but

Mr. J. J. Higgins. 23 May, 1885. Limestone formation.



at all events it has been cut off and is covered over by the disintegrated particles of the volcanic range. Then we come to the country showing on the surface the older conditions; that is, the undisturbed conditions of the limestone formation simply upheaved, but not disturbed by violent contortions. You find this 15 miles to the west of the Darling, in the bottoms of little lakes and such like. That obtains right out to the Paroo; and it is into that cretaceous limestone that the wells I am speaking of have been sunk. As the places become shallow, sea plants and erosion have placed a layer of loosened matter on top of the compacted limestone which has been raised. That has been pierced about 25 miles from the Paroo River, on Paroo Plains block No. 5; the place being well known as O'Grady's Well. The well is about 400 feet deep. O'Grady's Well.

6176. Describe the strata which occur there? For about 15 feet the well goes through that more or less friable strata, the result of deposition all over the surface. I cannot speak with certainty of the next 50 feet; it is a mixture which I did not examine particularly, but after that it gets into compacted impure limestone or sandstone, whichever you will. Strata.

6177. At what distance from the surface? About 50 feet. Then after slight breaks—I cannot say whether they have ever hit on the first drift that obtained—and getting salt water that has probably been made salt by percolation through strata which had been the bottom of a shallow sea for years, and would be to a large extent composed of decomposed sea-weed—it gets into the limestone of which I spoke, and goes through it for about 50 feet, coming to fairly good water and fossil shells at a depth of about 450 feet.

6178. And it passes through the limestone at about 450 feet? About 400 feet, or, allowing the other to extend further, say 350 feet, which would represent pretty nearly, I think, the compacted strata of which I speak.

6179. *Mr. Barton.*] Does the water rise in that well at all? Yes, but the only information I have as to the height is from conversations I have had. I think there is a rise of about 250 feet. Rise.

6180. *President.*] That is an open well? Yes.

6181. Do you know whether any of the salt-bearing stratum has been kept for analysis? I have never heard of any; I do not think it is likely that we have as yet any analysis. Analysis.

6182. Where is the next well that you have any particulars of? West of the one I have spoken of there is another, but I do not think that I need take up any time in describing it—the conditions are so nearly similar to those in the last. It is on Osaca No. 1 block, towards the western boundary of Sir Samuel Wilson's run. Other well.

6183. It is similar in every respect to the one you have already described? Yes, and about the same depth, evidently piercing the same strata.

6184. Do you know any other wells or bores? North-west of O'Grady's well at Urisino—West Paroo No. 2—there are two wells. The first is a small one about 3 feet square, and has a pretty continuous supply of water at a depth of 28 feet—pure, fresh, excellent water. Wells at Urisino.

6185. Does that water rise partly to the surface? No, it maintains a uniform depth; it is the bottom of a little watershed—a purely local affair.

6186. What is the water found in? In the top stratum I speak of—in that friable stratum—but from some cause or other it is not impregnated with salt. It is not easy to explain why that is so. This well is not connected in any way with the stratum I speak of; it lies above it, in the friable 50 feet. From some cause it has been arrested and lies on a compacted bottom of its own, above the other water-drift altogether. Perhaps it may be connected with some of the little creeks which obtain between the ridges; there may be a drift of some kind or other. It does not affect anything in the shape of artesian water.

6187. Describe any other well you are acquainted with? Nearly 7 miles north-east from the former, on the same block, another well has been sunk, and at a depth of 130 feet—of course some allowance must be made for the correctness of the figures I am giving—salt water has been struck; that is in the top stratum. They went through that and pierced the sandstone stuff at a depth of about 80 feet perhaps. Through some break or other which occurs—some drift connected with the loose stuff—the salt water percolates. At from 130 to 150 feet they struck very good water, a little salt, but good enough for stock; in fact good enough to drink. Then they sank deeper, intending to strike the same drift which was struck in O'Grady's well; but after going down 450 feet, an accident happened to the drill, and the work was abandoned. Another well was put down on Urisino No. 6, 12 or 14 miles west of the one I have just been speaking of, and at a depth of about 120 or 130 feet, somewhere about this compacted drift, they struck salt water—too salt to do anything with. Then they went down I think 400 feet, the difference in the thickness there being due probably not to any difference in the depth, but to the difference of contour on the surface. They got excellent water there, and a good supply; there were 7,000 sheep watering at it when I passed last.

6188.

Mr. J. J. Higgins. 23 May, 1885.

6188. Was it artesian water? Unquestionably.

6189. About what height did it rise? To within 150 feet of the surface—perhaps less than that.

6190. And the strata passed through was similar to that in O'Grady's well? Yes, and I heard that they got fossils at the bottom.

6191. Do you know of any other wells? About a little to the east of the first plain we spoke of lies a ridge, which I believe to be the watershed between the Paroo and the Bulloo Rivers. About 30 miles from the last well I spoke of brings us to the Bulloo Lake, which is a lake similar in formation to the lake on the Paroo; it is about 60 or 70 miles long and 20 or 22 miles wide in its greatest breadth, with a maximum depth, I have heard, of from 10 to 12 feet, and an average depth, we may say, of 5 feet. It disappears into drifts and by evaporation, the same as the others.

Bulloo Lake.

6192. It is formed in the same way as the lake you have described on the Paroo? Precisely. The well I was speaking of lies to the west of this lake about 17 miles, on the Bollwarry block, about 100 miles to the east of the South Australian border. We have already spoken of the overlying of plutonic matter over the limestone on the eastern side of this flat country which we have come over, with the system of small lakes with their own watersheds. As we get further west we come on to the remains of the old islands of the shallow sea, similar to the islands now in the straits to the north of Australia. These form the Mount Brown ranges, and the action of sea-water or of waves washing on them is still visible on some of the higher altitudes. With regard to the deposition of this compacted strata which we have already pierced, it seems to me, although I have not made any critical examination, that there is some kind of dip taking place, probably by the matter from the hills being washed down. It is the bottom of the old sea beginning to get level—beginning to come up as we may say—and at a depth of 150 feet we come on to good water at Connulpie.

Well on Bollwarry.

Old islands.

Water at Connulpie.

6193. Before you get to the good water do you pass through the usual stratum with salt water? I have forgotten whether there was water in that or not.

6194. But the same stratum was passed through? Yes; I examined the material taken out of the well and found it exactly the same.

Stratum.

6195. And that well is only 150 feet deep? Yes, and it contains tolerably good water and a very fair supply; but it is salt water—much salter than you would like to drink.

Depth of well.

Quality.

6196. But it does for stock purposes? Excellently well for sheep, but not so well for horses.

6197. Are there any other wells out there? 10 miles further to the west there is a well in which the water has been struck at a depth of about 100 feet, and a very excellent supply of water has been obtained, much better than that at Connulpie. It is close to the outlying ridges of the Mount Brown system.

Other well.

6198. And shallower? Shallower by 300 or 400 feet.

Depth.

6199. And did they go through the same strata there to get water as they did more easterly? Through exactly the same formation, and I am inclined to think it is the same strata.

trata.

6200. It is a cretaceous formation? Yes.

Formation.

6201. Do you know of any other wells to the south? I know of a well, but I cannot give you any particulars about it, except that the water is very salt.

6202. The information you have given us with reference to the wells includes the borings you know of in the western part of the country? Yes, the borings would be where the wells were sunk. The wells would be sunk a certain distance, and then the bores would be put down lower.

Borings.

6203. What was the size of the bores? 8, 6, and 4 inches.

Size.

6204. Do you know of any other places where bores have been put down? No, not where there have been any different results.

6205. Do you consider that the Paroo system is the same as the Bulloo, or is there a division? There is unquestionably a division.

The Paroo and Bulloo systems.

6206. What do you suppose that division is—is it an upheaval of any kind? Yes, a higher upheaval—probably a lateral force.

6207. Your theory is that there has been at some earlier age a sea on both sides of that upheaval between the two systems? Yes, and the upheaval itself has been covered by sea; it is only an inequality in the bottom of the ocean, or caused by irregular upheaval.

Upheaval.

6208. What do you suppose becomes of the water which is lost in the Paroo and Bulloo, and which forms those lakes? It percolates away into the drift and evaporates.

Percolation and evaporation.

6209. Is it the same water that is found in the lower cretaceous formation? That I could not say; it is possible that the system of percolation continues underground, and the water which is struck 200 miles away may be the water we lose here. Through the upper stratum above the compacted impure limestone an enormous quantity of water passes by percolation.

Underground water.

6210. But did I not understand you to say that that was usually salt water? Yes, that it is water partly salted by the decomposition of vegetable matter at the bottom, and which was probably at one time seaweed, and the deposition of salt at a later period when large bodies of fresh water began to collect and afterwards evaporate. Many of the plants there have had a marine origin, and developed to their present form by climatic and other natural conditions.

Salt water.

6211. Then you consider that the water may percolate through the upper strata and be found a distance away, or go down to the lower cretaceous formation? Yes, and possibly it meets with branches of the great underneath drift at various depths and runs away; there is no other way of accounting for its disappearance.

Underground currents.

6212. Do you know anything of a large dam on the Paroo? Yes.

Dam on Paroo.

6213. At what part of the river is it situated? I know six or seven dams on the Paroo; in fact, roughly speaking, from the 29th parallel to the lake I have spoken of the river is dammed all the way.

Position.

6214. Are those dams usually built promiscuously in the bed of the river, or are they sites selected where there are reefs of rocks? From the 29th parallel on the Paroo River there is a small channel approximately in the centre of a depression; and this channel opens out and the depression itself opens out also until at last the whole thing is nearly flat, and the dams are built across this little depression in the centre of the channel.

Sites.

6215. In building the dams, are sites selected where there are reefs of rocks? Not necessarily.

6216. What I want to know is, is it usual and practicable to make a dam across the Paroo that will stand with a by-wash without the dam being made of rock as a foundation, or the by-wash being cut through rock? Unquestionably; but you must protect the by-wash by gravel or stone, or some such material; it will be a constant object of attention; nothing will keep it but constant attention if constructed in the loose soil, but still it is done, and done practicably.

Construction.

6217.

Mr. J. J. Higgins. 23 May, 1885.

6217. *Mr. Barton.*] Do you know of any depressions or lakes or anything of the kind on the Paroo where large quantities of water could be stored, either by turning the river into these places or by damming the billabongs or depressions at any particular part, and so conserving large quantities of water after floods? On Kulkine creeks, about 30 miles to the east of the Paroo, there are low lying hills with narrow openings between them in which large quantities of water might be conserved by damming. I should think that some of these ridges would average from 4 ft. up to 15 ft.; perhaps a little more, but not much I should think. Storage.

6218. Is that the only place you know of? Between the Paroo and Bulloo there are large depressions, but it would be difficult to say what depth of water we should have in them; nothing but a complete system of levelling would ascertain that.

6219. Do you know much of the Cuttaburra? That is the Kulkine which I am speaking of. The Cuttaburra is an ana-branch of the Paroo it seems to me, but I have never run it round. The Cuttaburra.

6220. Do you think that there is any place on the Cuttaburra or Kulkine where large quantities of water could be dammed back? There is one place where a very large body of water could be impounded—at an out station between Nocoleche and Wanga Mana.

6221. Have you had any experience of the mud springs out there, or the soda springs as they are called? No; I have seen them, not here but on the head of the Gwydir. Soda springs.

6222. *Mr. Franklin.*] Have you seen the Paroo River in time of flood? Not in time of high flood. Floods.

6223. I suppose you know that the discharge is sufficient to fill any number of dams—as many as are placed there now? Yes. Discharge.

6224. Has it ever occurred within your knowledge that the upper dams intercepted the discharge and prevented the flow below? Yes, it has.

6225. Do you think it possible that by means of dams a sufficient supply might be conserved not only to fill the whole of the river, as far as it is defined as a river, but also to flood that large area of lakes and swamps? Unquestionably; it has been flooded or the lake would not be there. Supply.

6226. These lakes occupy an area apparently of 2,000 or 3,000 miles on the map? You might even add something to the well defined area, viz., the large area which would be covered with shallow water on the upper side of the lake. Area.

6227. That water would disappear by soakage into the soil? It disappears, as we saw, by soakage through the tertiary that overlies the compacted limestone and possibly penetrates it. Soakage.

6228. Then having disappeared in the ground it becomes deteriorated by contact with saline matters? From the evidence which I have given with reference to the formation you will be able to form as sound an opinion on that subject as I can. Water getting salt.

6229. As a matter of fact, I think it is generally known that as long as water is retained on the surface it remains pure? There is one condition which always obtains, that is that no matter how large a body of water may be it will become salt by evaporation.

6230. Even on the surface? Yes; the lake of Asphaltites and one or two others have gone through that process.

6231. But that would only occur in salt water in the lakes? No; it is caused by constant evaporation; even perfectly fresh water will become perfectly salt if it remains standing and evaporation goes on; if the outflow is less than the inflow the lake will become salt.

6232. Then as long as the particles of water are kept in motion it will be fresh? Yes, by overflow; motion by wind will not keep them fresh.

6233. Then supposing that a better system of damming were adopted on the Paroo—on the whole length of it—by which you might conserve water and regulate it down by sluices, it would remain pure throughout the whole length, and the whole of the dams could be charged? Unquestionably; but I do not know what would be the natural chemical action of saturation after such a system of damming had been in existence for (say) a period of 100 years.

6234. Then do you think that having regulated the water through the length of the river it would be possible to grade the water on a higher level, with probably a smaller fall, and so avoid that waste to the swamps? Yes; I have often thought that some system of the kind might be carried out effectually. Distribution from Paroo.

6235. Then it would run the water through the country? Yes; for about 30 miles on each side of the river, and small areas could be made productive by irrigation.

6236. Do you think it would be a great advantage if the waste waters of the Paroo could be regulated from the terminal point of the river, and through country where the water could be graded? Yes; that is the only system which could be carried out.

6237. Then it would be of importance to find where it could be graded out? Yes.

6238. Under the present condition of things it is simply a waste of water to throw it over the swampy ground? Yes, a waste of both land and water.

6239. Is there any timber to be found on the Paroo suitable for dam-building? No; there is timber there but it is not suitable for dam-making; I think that timber for the purpose would have to be brought up the Darling somehow; the timber on the Paroo is too crooked; there is a limited supply of beefwood, but I do not know how that would stand water. Timber.

6240. Is there any stone in the ridges you have mentioned? Yes; there is plenty of limestone sufficiently large to build dams. Of course this is only a suggestion, but I may mention that 30 or 40 miles back from the Paroo there are enormous masses of felspar which when burned makes pure plaster of Paris; that would be good enough for cementing the stone facings of dams. Stone. Felspar.

6241. Do you find that in large nodules which would make the slope of a dam? Yes; there are large cliffs of it on the banks of a lake near the Queensland border—water-worn cliffs nearly 20 feet high composed of pure felspar; it is also found in other places; there are thousands, or even I may say millions of tons of material there. Cliffs.

6242. So that in designing permanent works it would be better to use masonry than local timber? I should say so decidedly.

6243. And you are of opinion that with overshot dams the water could be regulated so as not to injure the people below, and to give them a fair supply? I think it would be necessary to have overshot dams. Overshot dams.

6244. *Mr. Murray.*] Do you think that much silting would take place if you had these masonry overshot dams? Yes. Silt.

6245. Would that not be a danger? That would have to be provided for in the construction of the dams. Silting will occur in any dam.

6246. Have you seen any cement made from the gypsum found in this district? No; but there is a house built Cement.

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built of it at a place called the Gypsum or the Crystal Palace down near Wilcannia, on the road between Wilcannia and Hay.

6247. In your opinion, what is the most suitable system of water conservation for this part of the country, taking the friable nature of the soil into account, and the difficulty of getting any high grade of land for canals or anything of that kind? That is a very comprehensive question. I should want time to get my ideas together, but I think that by a system of locks you might effectually get water about 30 miles on each side of the stream, taking the water from the higher to the lower levels.

Water conservation. Locks.

6248. *President.*] Are you speaking of the Paroo or the Darling? Of the Paroo; whatever dams are found to be necessary, the general principle will have to be the same in all of them, and the sites would be those best suited to the configuration of the country.

Wells and tanks.

6249. *Mr. Murray.*] In a great many places I suppose there is no possibility of getting water except from wells? Or else by making deep tanks. Tanks, unless they are over 20 feet deep, are not of much use for keeping stock alive, as they are not permanent.

6250. *Mr. Franklin.*] Do you know the Darling higher up? No, I am not at all acquainted with the Darling higher up, but I know some of its branches thoroughly.

6251. Do you know what they call the billabongs along the river? No, I am unacquainted with the Darling River; the Namoi and the Paroo, Peel, Gwydir, Mooki, and that system I know well.

Banks.

6252. I suppose you have observed generally on all these rivers that there is a large deposit of silt after floods, and this having been repeated for ages has raised the banks of the rivers higher than the surrounding country? That is the case at Bourke, as I can see, but further up it is unquestionably the case; in fact, on all alluvial rivers that I have examined throughout the Colony that condition of things invariably occurs—the deposited alluvium raises the banks.

Salt water.

6253. *Mr. M'Mordie.*] I think you gave it as your opinion that in salt water the salt is supplied by marine deposits? Possibly.

6254. Possibly or generally? Where water is found in the friable soil at the surface an enormous quantity of salt must be taken up and held in solution as it percolates through it.

6255. But I think you said that the salt is generally obtained in marine deposits? I think that it would be partly the result of vegetable marine deposit. Large salt deposits are not the result of marine deposits by any means; they are the result of the chemical action which I spoke of in cases of large bodies of fresh water under certain conditions.

6256. I thought you meant to say that where salt water was found it was obtained from marine deposits? No; I think that in percolating through formations formed by the deposition of marine deposits a large quantity of salt would be absorbed from the soil and held in solution in the water, but I do not wish it to be understood that the actual salt formations have anything to do with the marine organic composition; it is a chemical action, and a chemical action which will occur in all bodies of water.

6257. The salt water generally found is made salt by these deposits? Yes, I think so; from that and from the decomposition after deposition. That is where the salt comes from.

6258. I thought you intimated that it came from marine vegetation? Yes, so it does, but only as a subsidiary course from strata formed by the decomposition of marine vegetation, and forming the tertiary at the bottom of shallow seas.

6259. What I wish to understand is this: it is generally believed that where the formation is found containing salt, that that formation is a fresh-water deposit? I think it is.

6260. *President.*] But I thought I understood you to say that the upper strata you speak of in that country was in many instances the bed of a shallow sea? Yes, it was.

6261. Containing saline properties? Yes.

6262. And the water percolating through that extracted the salt? Yes; but the salt is the result of a natural action which takes place in all large bodies of evaporating water.

6263. Then you say that in some cases salt water derives its saline properties from fresh-water deposits that have become saline, and in other cases from the deposits of the inland sea? When the upheaval reached the surface of the sea a large quantity of water must have been impounded, then evaporated, and quantities of salt dried and deposited there. This has become mixed in the tertiary which obtains at the top now, but, as I stated before, this amount is but small compared with that deposited from bodies of fresh water at a subsequent period.

6264. *Mr. Barton.*] In the same way that that process is carried on now in Lake Torrens, where at one time you can see brackish water and at another time a foot or 18 inches of salt? Yes; as soon as evaporation takes place there is an end of the salt water—any percolation must be that of fresh water.

6265. *President.*] It is by percolation through salt deposits that the water becomes salt? Yes; the rain-water of the present time becomes salted in that manner.

Mr. Edward John Bloxham called in and examined:—

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6266. *President.*] You are a very old resident here? Yes; I have been living in the district nearly the whole of the last twenty-five years.

6267. In what capacity—have you been managing stations, or what? I was managing partner of the Bogan River Company.

6268. How many years ago was that? It was at the end of 1859 or the beginning of 1860 that I first took the management.

Flood.

6269. At that time I suppose there was no water except that found in the river beds—no artificial water? Just previous to my arrival there had been a considerable flood.

6270. But there was no artificial water? None; all natural water.

Droughts.

6271. This country has been and is subject to a series of droughts, is it not? Yes; if the whole time were taken together, probably nearly half of it might be called a season of droughts, perhaps about an eighth suffering from flood, and three-eighths fair to good seasons.

Seasons.

6272. From your experience, do these droughty seasons come in a series continuously, and then moister seasons continuously? Yes, I think it may be said they do to a certain extent; there is no regularity at all about them.

6273. You have not been able to ascertain any regularity one way or the other? No.

6274. There may come a number of seasons wet, and then a wet and a dry season? What I think we have generally had has been two or three very good seasons, and they have gradually got worse and worse until they became very bad.

6275.

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6275. And then improved again? Then improved; it goes round that way.
6276. During the time you have been here you have seen very high floods in the river? Yes; I have seen the highest floods any white people have seen. The flood of 1864 was the highest of all. In 1863 there was a flood perhaps 2 or 3 feet lower.
Floods.
6277. Were these floods higher than the flood of 1870? Considerably higher; the flood of 1863 must have been higher, but the flood of 1864 was certainly 3 feet higher.
6278. The floods then covered a very large extent of country? Yes.
Width.
6279. About what width do you suppose? In some places as much as 20 miles wide—perhaps more in some places; there would be islands here and there, but the flood extended to the edge of the red land wherever it was to be found.
Red land.
6280. Then the red land as a rule is not flooded land? No; the flood-water does not get on to the mulga there; the red land appears to me to have been the coast of an original lake.
6281. Is the red land the land you call mulga land? Yes.
Flow.
6282. Does the water flow rapidly in flood-time? It is a most extraordinary thing in my observation with regard to large floods that the water on the plains will be almost dead, but if you cross one of the billabongs which occur so frequently on both sides of the river, you find the current in the billabongs stronger than in the river itself; how to account for it I do not know, but I have found it so in my experience; it required a great deal of navigation to get across these billabongs.
Last seasons.
6283. Have the seasons of late been as dry as formerly? The last two or three seasons have been rather drier than former seasons, except those from '64 to '68. The last nine or ten months have been somewhat wetter than average seasons; we have seldom been short of 10 inches of rain, excepting between '64 and '68, and I look upon that as a fair average season; I pay no attention to the 16 or 17 inch reports we see.
Observations.
6284. Why, do you not consider them correct? I believe in my own observation.
6285. But do you keep any rain-gauge? I have often taken the rain-gauge.
Water conservation.
6286. During the last few years there has been a great deal of water conserved on various stations along the river? Yes, a great deal; during the last twenty years the works have been going on; in the first few years I was in this part of the country I did some very heavy works.
Storage and climate.
6287. Do you think that the storing of artificial water affects the climate here at all? I cannot say that it has done so to any appreciable extent. I noticed in the time of the big flood that there was quite a different appearance; every day we had heavy clouds—it was one continuous period of cloudy weather; but it was not the rain here that made the flood; in fact, little if any fell previous to the country being covered with the '64 flood, which was at its highest on the 1st April; the pasturage was magnificent, the result of the '63 flood; but the '64 flood, being 3 or 4 feet higher, covered and so killed all the perennial grasses, and these had no chance to recover till the end of the succeeding four years of drought; in fact, since that flood the perennial feed has hardly recovered to this day.
The '64 flood.
Perennial grasses.
Evaporation.
6288. I suppose you have no reliable information as to the evaporation that takes place? Yes, I have observed it very closely.
6289. With what result? That it is far greater than is ordinarily supposed; I have expressed my idea on that subject often. I think that during the six months from (say) the 1st September to the end of March the water will evaporate considerably more than an average of 1 inch a day; there are many days on which it will go over 2 inches; I think an ordinary tank having 10 feet of water in it on the 1st of October will be dry before the 1st of March, with no rainfall in the interim, even though no stock water at it.
6290. But I suppose you have no idea of the evaporation from the earth's surface after rain? No, I have had no opportunity of ascertaining with anything like precision; the water disappears very quickly indeed. Of course it depends a great deal on the time of the year when the rain falls; just now I should think there is scarcely any evaporation, or next to none.
The Darling.
6291. You know the country well, I suppose, in the vicinity of the Darling? Yes, I used to know every inch of it in this district.
Billabongs.
6292. There are a great number of billabongs and watercourses that go out from the river? Yes, ana-branches that go out and come in again; lower down the river there are some that go 10 or 12 miles back and come in again, but there are none at this end that go so far out.
Dams.
6293. Have you known any dams to be placed in the Darling? No, but there are plenty of natural dams.
Natural ridges.
6294. By natural dams you mean the ridges of rock? Yes, there are plenty of them; I think I could count half a dozen between here and 50 miles down.
Dams.
6295. You have known dams to be placed across the ana-branches? Yes, many years ago I put one myself across an ana-branch; that is the only one I remember; it was not a large one; I think there is a large dam in the same spot now, put there by Sir Samuel Wilson; that is what they call the Tallywalka on the Dunlop Run; that goes out further from the river than any one I know of; I think it must go 5 or 6 miles back.
6296. Is that dam formed simply of earth? I believe so; I have not seen it, and I cannot speak positively; the one I put there was an earth dam; it was carried away more than once.
6297. Had you a by-wash? No, there was no by-wash; it was built in a very shallow part of the Tallywalka, and was not a success; most of the water ran back again as the river fell.
6298. Do you think it is possible to erect dams across the Darling at the reefs of rock? I think it is quite possible; I think the only way to make the Darling available for traffic is to build up these natural impediments with the stone on the spot.
Earth dam.
6299. Do you think a simple earth dam would resist the waters of the floods? Certainly not—it would be washed away the first flood; I would use the stone that lies there.
Navigation.
6300. Then you would require locks? No; proper boats adapted to the river and to suit all our wants at the present time; in fact, to navigate the river in sections; speed is of secondary importance to certainty.
6301. How far would one of these dams back the water? My opinion is that four of these obstructions, raised about 20 feet high, would make the river perfectly navigable from here to Walgett at all times.
Acre's Rocks.
6302. Would you not apply the same principle below Bourke? To a certain distance perhaps; but I do not think that kind of work should be done for the benefit of Adelaide and Melbourne. One of the greatest obstructions is Acre's Rocks, half-way between here and Wilcannia; from this place to Walgett the river, by means of the weirs I have suggested, would contribute very largely to the traffic from the Bourke terminus.

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6303. Do you consider navigation of primary importance? Yes, in order to make the river a feeder to the railway.

Navigation. 6304. But supposing weirs were made across the river with locks, and the river filled with water, do you consider that that should be done in the first instance for the purposes of navigation? I do not think it would have any other beneficial effect than for navigation.

Irrigation. 6305. Do you think that if the river were kept full the flood-water would be utilized for irrigation or stock purposes? With regard to irrigation, I may be allowed to say, though it is an unscientific opinion, that I do not think there is sufficient rainfall on the western slopes to irrigate the country 5 miles back from the river.

6306. I think you said just now that the river is 20 miles broad in heavy floods? Yes; I have seen 3 feet over the bank of the river here.

6307. Supposing a large portion of that water were prevented from running to waste, would it not irrigate a great deal of country when stored in natural basins at various places? Yes, no doubt it would, but a flood occurs so very rarely; but when they do occur, the natural depositories being all full, medium floods would be as devastating as the highest floods we have known, and would come much more suddenly upon us.

Height of floods. 6308. But you have the river-bed full, I suppose, every year or every two years? Yes, there is more or less of flood in the river every year, but nothing like a banker or even half a banker can be relied upon.

Irrigation. 6309. Supposing that most of the water that comes down in flood-time were stored, would not that suffice to irrigate a large extent of country? I do not believe that it would irrigate more than 4 or 5 miles back from the river—not for a thoroughly adequate system of irrigation. I believe, however, that those 5 miles would carry more stock than the whole district does now.

6310. But supposing a system were adopted by which the bed of the river was kept full of water with a system of weirs, do you not think that, as far as it would go, the water would be utilized? It could be utilized; but, however much you get in the river, I do not think you could keep sufficient to thoroughly irrigate more than 4 or 5 miles back.

Utilization of water. 6311. But do you think the people along the river would take advantage of the supply and utilize it? I have no doubt they would as far as it would go, if supplied to them at small cost. At the same time, I think

Cost of dams. the construction of anything like masonry dams or locks in the river would be a greater expense than the country is worth in fee simple; the country is not good enough to stand such an enormous outlay.

6312. What do you estimate would be the cost of putting weirs across? I could not form an opinion. We have plenty of water for all practical purposes, putting wholesale irrigation out of the question. All the water that would come naturally backwards we can do as well without, because it would not go far enough to do continuously any practical good.

Banks. 6313. Are the banks of the river higher than the land further away? The banks are always higher in every watercourse in these flat countries.

6314. Do you know what the cause is? No, it is a puzzle to me. I know the country is gradually getting

Flood deposits. higher in the course of ages. Every flood that covers the valley of the Darling gives one inch or more of deposit, but the banks of the river being the last places covered often miss getting the deposit that is left elsewhere, and thus their being the highest parts is the more unaccountable.

Distribution. 6315. Supposing water were conserved and diverted into broad channels or canals made to carry streams in different directions, do you think that would improve the country in the filling of tanks? As far as the Darling is concerned, I do not think you could carry water more than 20 miles back, because sometimes the country rises nearer the river but seldom further away than 20 miles. If the red ground is closer to the river on one side it is always some distance away on the other.

6316. Do you know that in the flood of 1870 the waters of the Darling and Lachlan very nearly met? The country must be much lower than I imagine if it did.

The Willandra. 6317. Do you know the Willandra Billabong? Yes; but I cannot imagine that the Darling waters reached there. The narrowest place between the junction of the waters must have been at Terrawinnia Lake, where the dry land must have been fully 70 miles in width. There is a backbone between the Lachlan and the Darling, as there always is between any two watercourses in these districts.

Lakes. 6318. There is a great number of lakes and watercourses that could be filled from the Darling? Yes, but for no practical good; they are too near the river, with a few exceptions on the lower river, such as Terrawinnia Lake.

6319. But if water were taken 5 or 6 miles from the Darling, would not that be of practical good? Yes, to some extent, but stock can reach the river from that distance.

6320. Supposing it is not permanent? It would do good to make it permanent, but to no very valuable extent; stock can go to the river.

Growing capacity of country. 6321. Supposing people could obtain water for irrigation, do you think this country is capable of growing any great quantity of hay? It is capable of growing any mortal thing, with sufficient irrigation—no other country can equal it; but on the other hand, there is no country that requires so much water for irrigation purposes, in consequence of the dryness of the climate.

Hay-growing. 6322. But supposing the station-holders along the river adopted the practice of growing hay and storing it, could that be practically carried out? It would be carried out to a greater extent if the holdings were smaller, but I question if the larger holders could ever carry it into operation successfully.

6323. But if the holdings were smaller? Then people, I think, would be more likely to try to provide for a smaller number of stock.

6324. But supposing that a man with a small holding had means at his disposal to irrigate and grow as much as ten small holders would do, would he not do it? There is nothing to prevent him from doing it now; there is always plenty of water in the river for small irrigation works.

6325. But supposing a number of squatters along the river all adopted a system of irrigation, would there be water enough? Not to water any great extent of country—not further than 5 miles on each side; but still if they would do it, why do they not do it now?—There is nothing to prevent Sir Samuel Wilson from attempting to cultivate; he has plenty of water to irrigate a considerable extent of ground, and plenty of money to do it with.

Toorale and Dunlop Stations. 6326. Of which station are you speaking? Toorale and Dunlop.

6327. Has he suffered from dry seasons? He has suffered in the same proportion as other people have; he has a very large extent of back country and 70 or 80 miles of Darling frontage, besides the Warrego and other watercourses.

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6328. Then, from the nature of your replies, you do not consider that much good would be done by weiring the Darling, keeping the bed of the river full, and filling up the ana-branches and all natural depressions where water could be stored? As far as stock go it would not be of much good, but it would be beneficial in making the river a feeder to the railway by means of navigation.

Railway versus Navigation.

6329. But do you think it necessary to depend entirely on the navigation of the river? You will want something to find traffic for the railway.

6330. But supposing the Government were to make a railway along the river? That would do perhaps better than navigation. But I think the mode of damming the river which I propose would be cheaper than a railway along the river; a railway along the river would go through flood country.

6331. But supposing it was carried on high country along the river—it need not be very close to the river, but sufficiently close to carry all the produce? Oh yes; I think the railway would be preferable, but question much if the traffic within its influence would pay working cost, without interest on construction.

Cost of railway and weirs.

6332. And what do you think would be the cost of a railway as a feeder to the line—say 100 miles in each direction, up and down? If it were constructed on the same principle as the railway to this place, the cost would be vast. I have never yet been able to learn what it does cost, but have heard over £4,000 per mile.

6333. But supposing a line were made at a cost of £3,000 a mile, that would be £600,000, and if you were to put there six or seven weirs across the river do you not think they would cost as much? No; I think the weirs I speak of could be constructed for £20,000 apiece.

6334. That would be for the purpose of navigation only? That is all.

Sections.

6335. And then you would have sections in the river and make the steamers unload at every weir? Yes; it is all the country is worth; you cannot afford to erect heavy masonry works.

Value of irrigation.

6336. But suppose the country were irrigated 5 miles on each side of the river, would it not be worth the outlay then? It would make the country more valuable, but the cost of it would be heavy to the people who made use of the water. I know they could grow anything and everything, but the question is whether the people up country, having no costly irrigation to pay for, could not supply us at a cheaper rate.

Value of land.

6337. What would land be worth per acre with plenty of water—what would it be worth on the extra production? No doubt you could keep five times more stock on it than you can keep now.

6338. Then the land would be increased by five times its present value? I think so, but perhaps it might cost ten times its present value to bring about that increased value.

6339. And would it be worth £1 an acre to pay for water, supposing you could obtain plenty of water to irrigate it properly? I do not think so.

6340. Not if its value were increased five times? No, I do not think so; it is not only the cost of obtaining a sufficiency of water, but the cost of applying in sufficient quantity to meet the extra requirements of such an arid climate.

6341. What is its value per acre now? Speaking from sorrowful experience, I may say that every man relying upon this country here alone, without anything else to back him up, is ruined once every seven years.

6342. Then it is worth less than nothing? It is so; as hitherto held it is ruination.

Loss of stock.

6343. There has been a great quantity of stock lost in this district during the last drought? Yes. I would not call it drought; it has been somewhat drier than the ordinary seasons, but it was not such a drought as we had from 1864 to 1868.

6344. What proportion of stock do you suppose has been lost? Some people talk about one-half, but I do not think it has been nearly so much; I should say one-third.

Causes.

6345. For want of grass or want of water? Want of grass—a great many more have been lost from want of grass than from want of water; there may be more water saved from rainfall in all seasons than is sufficient for all the stock the ordinary rainfall will provide feed for.

Underground water.

6346. Have you had any experience of the underground system of water in this district, more especially between this and the Queensland border? Only in the neighbourhood of the river; and I have had some experience at Bourke. I have found that you have to sink 40 feet to get water here, just to about the level of the river at the present time, but if the river were full there would be no more water in the wells.

Salt water.

6347. That is near the river? Yes. If you get any distance beyond the river you come upon salt water at depths varying from 15 to 60 feet.

Mud springs.

6348. Do you know anything of the mud springs? Yes, I have found many of them.

6349. Do you think they contain permanent water? They contain permanent thin mortar.

6350. Can you take out enough to get pure water? No, you cannot get a drink, except of this liquid mortar, which fills in as fast as you bale it out.

6351. We had evidence this morning of 10,000 sheep being watered at one spring? I have never seen it; nothing can drink stuff of the consistency of the overflow from the mud springs, as they are called; but I am under the impression that it is the same water as is found in the reed springs alongside them, but where it comes out in the liquid mud state it is water forced through a bed of pipeclay.

Reed springs.

6352. And where these mud springs are found do you find clean springs alongside them? Yes, within a few yards. At the mud springs you will see a white mound with nothing whatever growing upon it. The reed springs, in their original state when first found, were like a sugar-loaf of green river reeds, exactly the same reed as the Murray River reed, although I do not suppose that between here and the Murray you will find a reed of the same description.

Source of underground water.

6353. I suppose you have no idea of any system of underground water? I conclude that the water comes from the coast range—the range from east to west in Queensland, and from north to south in this Colony.

6354. Or from the northern Queensland range? Yes.

6355. But I suppose the theory is that the water soaks underground and reappears in certain places? Yes, through strata more pervious than others. If it was possible to trace the course of the underground water there would be a plentiful supply of water to get along with grass, though probably not a wide stream. It is very difficult to trace I fancy. It is beautiful water in the clear springs, but there is really no water in the others; it is mud—though if pipes were sunk I dare say you would get water below the pipeclay. I may mention a curious thing in connection with one of these mud springs—one of the largest I ever saw, and close to one of the best springs in this neighbourhood—at Yantabulla. I used to be in the habit of going across there before the country was much inhabited. Once, when passing the spring, I saw an immense mound, which had disappeared when I came back, having apparently sunk down to where it came from; had I ridden over it, my horse and self would probably have disappeared.

Yantabulla spring.

Mr. E. J. Bloxham. 23 May, 1885. Goonery Spring.

6356. Were you the original discoverer of the Goonery springs? I believe I was.

6357. How many years ago was that? That would be shortly after I came here, probably in 1860 or 1861. The place was then a mound of reeds. These reeds were in a cone which seemed to have been formed of decomposed vegetation. You had to look down from the top of the cone, and then you saw the water some distance down.

6358. Did you consider that that was an extinct mud spring? No, entirely different in appearance, and the liquid produce—one nothing grows upon, the other the most luxuriant river reeds. There were mud springs close alongside it. But although it was a grand spring to look at, it was a failure as far as springs go. I could see that it did not make a great deal of water, and I had a 200-gallon cask which I emptied and filled from the spring, after taking some of the decomposed vegetation out of the bottom. But I could only fill the cask in twenty-four hours; it would not supply more than 200 gallons in twenty-four hours, and yet it was a splendid-looking spring. The best spring for supplying water is one near the Warrego, I believe

Leila Spring.

now called the Leila Spring. I took it up as a mineral selection in those days, before we ever heard of minerals in this country. I think it will be found to be the earliest selection made in this district after the passing of the Land Act of 1861 as a mineral purchase.

6359. Then it is alienated? It was, but it has been allowed to lapse since. I think the Government took half of it away originally, and the rest of the purchase has been allowed to lapse.

6360. And is it a reserve now? Yes, though I am inclined to think there is a 40-acre purchase of some sort belonging to the station on it still—an improvement purchase probably. But that was a very fine spring. During a very dry season we kept three or four flocks of sheep constantly watered there. We had an embankment 4 feet high all round it. That used to fill with water, and then we had a pipe to lead it over the top.

6361. Was the water good? Yes, very good.

Trusts.

6362. Do you think that, in dealing with the water systems of the various rivers, it should be left to private enterprise as it is now, or that there should be legislation to deal with the whole water system by the establishment of Trusts? I cannot imagine any great good from dealing with the rivers except for navigation purposes.

6363. But I am speaking of any river system—take for instance the Paroo, the Warrego, or any of these rivers in connection with which you might form a Trust for the purpose of conserving water, and the same would apply to portions of the Darling? I think the matter would be better in the hands of Trusts than in those of the Government.

6364. To be administered locally by practical men? Certainly. Our experience here is that we can manage matters better locally than the Government can manage them at a distance.

6365. And though you do not think that any great improvement would take place, still if any improvement would take place the matter should be in the hands of local Trusts? I think so.

Boring.

6366. Have you had any experience in boring? None whatever. From what I hear, it has been a failure here so far.

6367. But you have had no experience of a private nature? No. On reconsideration I would like to amend something I said in a former part of my evidence. I dare say it will be recorded that I thought the turning of

Filling of billabong.

the waters into the billabongs would be of little or no service. I would now say I think it would be of some service, though it would be of no great importance. It would be of some advantage to get water 3 or 4 miles permanently out from the river. Generally there is water in those places, but it would be better to make it certain.

6368. And you still think it would be of little use trying to divert a stream of water through the dry country? It would be of use if it could be done, but my experience of this country is that 10 miles back it rises into high ground and you cannot——

6369. But if it could be done it would be of great use? Of course it would.

Irrigation.

6370. We have had some evidence in reference to irrigation near the river—you said that water enough might be obtained to irrigate 5 miles on each side of the river? There might be enough, but I hardly think there would be.

6371. Supposing that could be done, do you not think that it would ensure the safety of as much stock as there is on the stations at present? These 5 miles would keep more stock than the whole of the district keeps now, and would ensure a vast deal better wool; because some time in every year in this country the sheep are in such a state—I will not say exactly of semi-starvation, but in a falling-off condition—that the wool always suffers in consequence. For a month or two or more in every year in this district that is the case; they are never thriving the whole year round. If you had 5 miles of irrigation on each side of the river you would always have green grass, but the sheep on the irrigated land would not be so healthy.

Irrigation and sheep.

6372. Why do you think the sheep would not be so healthy? You would have foot-rot, and probably catarrh and fluke.

6373. Did you ever know of fluke in the salt-bush country? No, I do not think I have, unless brought there by sheep from fluky country, but the salt-bush would be no antidote to fluke in constantly flooded ground.

6374. Did you ever know sheep get fluke from feeding in cane-grass swamps? No; there is nothing there to eat. The cane-grass swamps have nothing in them but tufts of cane-grass far apart, acres being quite bare and shining when dry like the bottom of a saucer. The cane-grass is almost like diminutive sugar-cane.

Evaporation.

6375. *Mr. Barton.*] In giving your opinion as to the evaporation in this district, I see you put it down at about 16 feet for the summer months—have you ever employed any test to enable you to arrive at that? I do not think I said that.

6376. You said an inch a day on an average for six months? I am within the mark if I did say so. There are plenty of days when it goes 2 inches a day.

6377. Have you ever taken any means of testing the evaporation? No, perhaps not. I have seen a dam on the Toorale Station which I suppose kept back 10 or 12 feet of water, and which was protected by trees, and I have known it to dry within six months after it was full.

6378. Have you ever had any experience of a tank sunk for stock—say a 20,000-yard tank—and left for the season without any stock being watered at it? No.

6379. There might be absorption as well as evaporation, and you may be confusing one with the other? There will not be so much soakage out of the natural bed as through the broken surface of a dam or tank.

However,

Mr. E. J. Bloxham.

28 May, 1885.

However, I have had no such experience as a six months' test of a tank without stock watering at it, but I have seen water going so fast that I know it must have been at the rate I have mentioned.

6380. Do you know of any large depressions, large billabongs, or dry creeks, in close proximity to the Barwon or any of these rivers, where by a reasonable outlay large quantities of water could be conserved? I would instance the Dry Bogan, which I look upon as a billabong of the Darling. It would not be very hard to fill that and to stop the water. Dry Bogan.

6381. And do you not know of any large natural reservoirs as it were? The same remark would apply to all the billabongs, but they are not a sufficient distance back to do any great good. Reservoirs.

6382. Not to conserve water that might be taken elsewhere? No, I do not know of any natural depression except billabongs of any depth. The nearest one I can think of is one we used to call the Utiara Swamp, on the Toorale Run. It was one of those cane-grass swamps, in fact, and it was filled with water in the time of the big flood. Of course as the flood fell away the water fell out of it. From what I recollect of it, I think a bank of 3 or 4 feet for ½ a mile would have kept the lake full of water 5 or 6 feet deep. There are plenty of these cane-grass swamps. Utiara Swamp.

6383. You stated that you had had experience of the great floods in this district—did you mention that you had experience of any flood before 1863? At the time I delivered sheep from Bogan Station to Furlong, some of the flocks were standing in water. That was in the 1863 flood; and when I first came here there must have been a flood just preceding, because the country was in a most luxuriant state, as we only see it after a large flood. Floods.

6384. From your experience in the country before and after stocking, and stocking heavily, is it your opinion that, as the country gets stocked up, these various rivers and tributaries of the Darling will be subject to much higher floods than before; or do you think otherwise? I do not think that will affect it much, because the local rain never affects the river to any extent—the water all falls away from it. Effect of stocking

6385. But I think you know that when you first came up here, and after the flood of 1864, we have had 3 or 4 inches of rain that put no water into the local rivers; I think you must have witnessed that in January, 1868, for instance? We had no rain from 1864 to 1868. The rain of January, '68, was unusually heavy, and probably had a slight effect on the river, but no merely local rain would make the river rise more than 2 or 3 feet, and it would be at its former level within ten days. Local rains.

6386. But this was only a rain in January? The country is more trodden now, and more rain enters the river, but only to a very limited extent. I think it might possibly affect the river a little more than it did in those days. The ground was not nearly so well trodden down then as it has been since. I was thinking of this with reference to what future floods might do, if we had great floods again such as we had in 1864.

6387. Whether the same quantity of rain would produce a much higher flood? I do not think it would. Every river in the country must be in flood as it was then to produce what we had then. I do not think that the fact of the ground being trodden hard would affect the size of the flood—not when it comes to be a flood of that kind.

6388. As to that proposition of yours to lock the rivers simply for the benefit of transit, or rather of damming the river and navigating it in sections—do you think if it was possible to put a railway on the high ground on either bank of the river up and down for 100 miles, that that would be a more economical and satisfactory way to bring the traffic than by damming the river? I do think it would be much better. I do not know whether the cost would not be greater, but it would be safer and more regular, and do away with the necessity of insurances and many other drawbacks incident to navigation. Railway and navigation.

6389. Now, in the matter of irrigation, I heard you say that you thought that by irrigating the country it would carry five head of stock to every one it carries now: what is your opinion as to the average number of sheep the country will carry at the present time? Any man who attempts to make it carry more than one sheep for every 8 acres will be a heavy loser, and many have lost heavily at that. 8 acres for one sheep I regard as necessary to safety, and during plenty of years they would be in a state of semi-starvation if there were 80 acres to every sheep. Irrigation. Sheep-carrying capacity of country.

6390. And is it your opinion that it would take an acre and a quarter to carry a sheep if the country were irrigated? I really believe that less would do, certainly less if under English perennial grasses.

6391. Do you know that land irrigated by squatters as an experiment has been known to carry thirty sheep to the acre? Not within my experience—not from natural grasses I should think.

6392. No, not from natural grasses, but from English grasses? The country would carry five times the present quantity of stock if it were irrigated.

6393. What do you estimate to be the actual profit on every sheep kept in paddocks in the present circumstances? Much depends on the position. Profit on sheep.

6394. Well, say in the immediate vicinity of Bourke—between here and Brewarrina—suppose I had a run of 10,000 or 20,000 sheep upon it, what should be the yearly profits on these sheep, under the best and most economical management, making allowance for every expense: what I want to know is the present profit as compared with the profit under irrigation? That is a question which requires consideration. My own opinion is that there is no profit arising to people from keeping sheep in this district. I would not like to name a sum. People have made money by buying empty runs, and then stocking and selling them.

6395. There was a lake mentioned to-day called Lake Denman? I often used to ride across that country without knowing that there was a lake there, but as a place for saving water it has become very valuable since then. I was never fortunate enough to see any water there. I have not been there since the country has been inhabited, but I may never have gone across the right spot. Speaking of the billabongs, I think a great deal might be done by the removal of a bank which invariably forms near where they come out of the main stream; that is the case at the junction of the Dry Bogan. If a cutting were made the Dry Bogan would often have a much finer supply of water than it has; and upon a large scale there is the Cattawarra, which might be made to run every time the Warrego runs. Invariably there is a bank where a small stream comes out of a large one. Lake Denman. Cuttings.

6396. *Mr. Franklin.*] You are well acquainted with these billabongs, are you not? Yes.

6397. Have any of them been formed during your time? No.

6398. Is it your opinion that these billabongs were at one time part of the river bed? No, I think not—not of the original course of the river. I think every flood tends to deepen the billabongs, as a very strong current sets through them; as a rule they make a short cut from one bend of the river to another, and the water has only half the distance to travel to what follows the bed of the river. Formation of billabongs.

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Erosion.

6399. Do you believe that if you were to make a cutting through a sharp bend of the river as straight as you could carry it the banks would erode and give you a straight run, leaving the old bed as a billabong? By breaking the ground you might make the cutting become the main bed of the river.

6400. As a matter of fact, the material in this district to the depth of the river is likely to erode by the pressure of water during flood-time? The clayey bed of the river does not alter much, though the banks do considerably.

6401. But is it possible that the banks will erode and make a more direct channel? I do not know any instance where it has done so, though I have known points to give way and fill up at opposite points. At a point on the Darling River, in the middle of Bourke, at least 20 feet have gone from one bank of the river, and the bank on the opposite side has made up somewhat in consequence.

Stationary water from overflows.

6402. Have you observed, in every case that you are acquainted with, that the water which overflows from the billabong will remain stationary on the ground over a large area after the flood has subsided in the river? I do not think so—I think they drain away as a rule with the river.

6403. You do not know of any country falling back from the river? I do not know of any part of the country where the water remains to any useful extent in this part of the Darling after a flood; it always finds its way to the river again.

The Darling a drain.

6404. Can you give us any idea of how the billabongs were formed in the first instance? I cannot tell you. For my part I look upon the Darling as a drain kept open by the western rainfall, after the original salt lake (which now forms the valley of the Darling) silted up to such an extent that, after some such rainfalls as caused the '64 flood, the salt lake broke over the bounds that held it, cutting an outlet at a place now known as the Clifts (on the Tolarno Run, I think), joining the waters of the Murray salt lake; the united waters then cutting a road through by the Mallee Clifts into what is now Lake Alexandrina.

6405. You do not know any case where a billabong has overflowed its banks, and there being no creek in the vicinity the water has lain there a considerable time? No, it falls with the flood.

Raised banks.

6406. What is your general impression as to the height of the banks of the river—are they generally higher than the surrounding country? Yes; and often the banks of the billabongs are higher than the country at the back.

Sheep per acre.

6407. In estimating that you could not place more than one sheep to 8 acres, did you confine yourself to this part of the country? There are many parts of the country where they could not put sheep at all, having as yet no water supply. I was speaking of the Bourke district, or, I may say, of the Darling, because they can do no better all down the Darling than we can do here.

6408. From your answer it might be inferred that you spoke of the whole country? No; I spoke of the country from Brewarrina downwards.

6409. Would you modify your statement with reference to the country nearer to the rainfall? Yes; the further east you go the capacity of the country becomes greater. Perhaps, if there is any difference as you go westward it becomes less.

The Paroo.

6410. Do you know the Paroo River? Yes, from about 100 miles above the border.

6411. Have you ever seen that river in flood? Yes; but it was only in 1864 that it was known to get through to the Darling.

6412. What has prevented its running through? There is no channel—the river spreads out.

6413. The latter part of it has no defined course? An observant person could trace it by the timber; it runs into lots of billabongs and flat country. A large area of it runs into swamps, forming in fact a series of small, shallow lakes.

Diversion from the Paroo.

6414. Supposing you stopped the river where it has well-formed banks, would it be possible to lead the surplus water by a canal through the low dry country? I have no doubt you might turn it off to the east or west, but you would get no depth.

6415. But does it not occur to you that there must be an enormous quantity of water wasted, and that it would be worth while to inquire whether that could be stopped and stored? I do not know of any natural places where it could be stored. You might turn it into the swamp country, but it would last no time.

6416 But do you not think it worth while to ascertain whether some storage place could be discovered? I do not know the country well enough to answer that question.

6417. But do you think the matter of sufficient importance to warrant further inquiry? Certainly.

6418. We have evidence that there are many dams on that creek which discharge water over large areas of country, and that soakage takes place before the river reaches the swamps? Does your evidence show that there are any natural reservoirs?

6419. No, it shows that there are large areas of swamps, and that if we diverted the water from the terminal points of the well-formed channel it might be stored and conserved in its transit through dry country in tanks? My opinion is that there is no part of the country lower than the bed of the Paroo itself.

Effect of diversion on the Darling.

6420. But suppose we could save the water and convey it into the bed of the Darling, would not that raise the water in the bends and be beneficial? Every little drop of water does assist the Darling, but neither the Warrego nor Paroo water alone would have any material effect on that river.

6421. But would not a constant supply maintain the current and keep the water very much better for stock than it has hitherto proved; the Paroo watershed would not keep up a constant supply to the Darling? There has always been a current in the Darling, and abundance of good water for stock.

6422. Then the surface water of the Paroo would not benefit the Darling itself? No; it is only in times of excessive flood that it reaches the Darling at all. Those swamps you spoke of are a considerable distance from the Darling.

6423. I want to lose sight of that altogether, and to bring the water that makes them into the river below? It would aid the river a little, but not very much, and would not be constant. The Paroo is a very paltry stream—you can cross it in many places without knowing it.

Lowest part.

6424. Can you give me the name of the lowest part of the river where it begins to run into the swamps? The country at the bottom of the defined line of the Paroo consists of hard, red mulga ridges. A survey would be necessary to prove the depth of cutting necessary to convey the water from the defined bed of the Paroo into the Darling; probably the greatest depth would not be more than 8 or 10 feet, but I think it would be of little service beyond occasionally giving water to the blocks through which the cut passed.

Value of land.

6425. *Mr. M'Mordie.*] You stated that the land in the Bourke district taken over a period of seven years is not worth anything? My opinion is that it is ruin for a man who depends on sheep only, and the prevailing absurd ideas of grazing capacity.

6426.

Mr. E. J. Bloxham. 23 May, 1885.

6426. What is it of any value for, if not for sheep? For blackfellows and kangaroos, or perhaps for one sheep in place of the three it is now expected to keep.

6427. Might I ask you what price quarter-acre blocks of land are now selling for in the town? They have been fetching enormous prices; they have brought as high as £2,500 for half an acre,—prices that have contributed much to the present local commercial depression.

Chinaman's garden.

6428. *President.*] Do you know a purchase made by a Chinaman on the bank of the river? It is not on the bank of the river. I suppose you are referring to Tim Yung's garden. He is said to have paid £3,000 for 6 acres of land, but it was an already formed garden, and a large sum of money had been laid out on it. However, he will never pay it.

6429. What is he using that land for now? For a garden.

6430. He is carrying out a system of irrigation? Yes; he pumps the water out of wells, and the consequence is that his garden is not nearly so good as the gardens of those who get their water from the river itself.

Irrigation. Quality of water.

6431. Then you conclude that the water in the river is better than the water in the wells? Far better for irrigation purposes.

6432. Do you know of any case where irrigation has been resorted to and has failed? The well water will kill some things.

6433. I am speaking now particularly of the Darling water? I think it is splendid for irrigation purposes—it contains an immense amount of fertilizing matter; but I am not aware that irrigation to any extent has been tried; I know of nothing more extensive than the Chinaman's garden.

Productive land.

6434. And if there was sufficient water to irrigate to any great extent, irrigation would make the land more productive? Yes, I cannot imagine any more productive land than this, with complete irrigation; but it would require an exceptionally large quantity of water.

Mr. Edward MacFarlane, District Surveyor, Bourke, called in and examined:—

Mr. E. MacFarlane. 23 May, 1885.

6435. *President.*] How long have you been district surveyor here? Since the commencement of this year, and acting district surveyor since 1881.

6436. What part of the Colony were you living in before that? I was working from Dubbo between Mudgee and the north-western part of this district.

6437. You have taken considerable trouble to make yourself acquainted with the underground water system of the north-western and eastern part of this Colony, have you not? I paid attention to what I saw as I went along. I have travelled over almost the whole of this part of the country.

Mud springs.

6438. You are well acquainted with the country commonly known as the mud springs? Fairly well; I know the locality of most of the springs.

Situation.

6439. Can you indicate any system or supposed system of those springs? I think so. The line of springs in New South Wales begins about 10 miles from the Queensland border, and about 30 miles from the Culgoa River, in a north-westerly direction. There are three or more springs there, all close together, and within an area of 180 acres.

Plans.

6440. Have you plans of those springs? Yes. The names of the springs are Moulton; south-westerly from those springs are Sandy, Tooloomo, and Shearer's Springs (Shearer's or Gerrara).

Direction.

6441. In what direction are they? They all follow a south-westerly course.

Distance.

6442. And how far distant are they? From Moulton Springs to Shearer's Springs the distance is about 18 miles.

6443. Is the water similar in all those springs? I could not tell you anything about the nature of the water.

Country.

6444. Is the nature of the country in which they appear the same? Yes.

Source.

6445. Where is the next spring? The next is Collis's Spring, about 18 miles further on, also in a south-westerly direction. The next spring is Nellie Spring, about 12 miles from the last.

6446. The water in the springs you have named you suppose to come from the same source? Yes; apparently it comes from a north-easterly and goes in a south-westerly direction.

6447. Have you any information as to the width of the country in which the springs are situated? None whatever.

Bores.

6448. Have any bores been put down in the springs? None that I know of.

Line of springs.

6449. Does the water flow over the surface? A little at all of the springs. The springs are all small and unimportant, but they indicate a line of spring country.

Country.

6450. Is the country level? Fairly level—undulating country.

Kullyna Springs.

6451. Now take the next series of springs? The next would be the Kullyna Springs situated about 50 miles almost north of Bourke, and 2½ or 3 miles east of the Warrego River. The next spring is Leila Spring, to the west or a little to the north of west, and about ¼ of a mile from the Warrego.

Goonery Springs.

6452. Are there any further springs continuing that series? The next in continuation of that series is the Goonery Spring.

Distance.

6453. How far is that distant? About 50 miles distant, in a south-westerly direction.

Malya Springs.

6454. Are there any further on? The next would be the Malya Spring, about 50 miles south-west of Goonery. Next to that is the Wee Watta Spring, about 8 miles south-west of Malya.

Spring near the Paroo.

6455. Do you know of any springs further south? I know of no springs south-west of this where the water comes over the surface. Warroo Spring near the Paroo River, and near the Queensland border is the most north-western spring of another series.

Jacombe Spring.

6456. Where is the next of that series? The next I know of is the Jacombe Spring, but I understand that there are some springs intervening on the same line.

Other springs.

6457. What is the next one? The Yantabulla Spring; then the Boongunyara Spring, distant from the Jacombe about 10 or 11 miles. 6 or 7 miles further on we have the Youngarigina, still going towards the south-east, and again the Coonbillie Spring, 6 or 7 miles more east than south-east of the last spring.

6458. Is that the last of the series? Yes.

Direction

6459. The series you have just been describing runs from north-west to south-east, in an opposite direction to that of the first and second series? Yes.

6460.

Mr. E. MacFarlane. 23 May, 1885.

6460. Then I understand that, in your opinion, there is a line of underground artesian water running from north-east to south-west in two parallel lines? Yes.

6461. Can you say how far distant they are from each other? The first two series are about 16 or 18 miles apart, the second continuing further to the south-west than the first; a third series, coming from the north-west to the south-east, seems to cut the second at right angles.

Strata. 6462. Have you any information as to the depth of the strata through which those springs come? None whatever.

Boring. 6463. Has there been any boring at any of the springs? Bores have been put in at Goonery and Wee Watta, but I do not know to what depth.

Supply. 6464. Did they strike the water? Yes, in each case a full supply has been obtained from the bores.

System of springs. 6465. Then your belief is that there is an underground system of springs running much in the same way as the surface water runs? Yes.

6466. But you have no information as to the width of the run of water? None at all.

6467. And you do not know in what layer of clay or whatever it may be that the water is confined before it rises to the surface? No, I have never had time to make a close observation of the places. I simply became aware of their existence generally, with a view to securing as much reservation as possible at them.

6468. There are other springs throughout that country with which you are not acquainted? Most probably.

Reservation. 6469. Have the Government made reservations at most of the springs? At all the important ones there is a sufficient reservation.

Thully Spring. 6470. Is there anything further you wish to state with reference to those springs? There is a spring called Thully Spring lying to the south-east of the springs of which I have already spoken. It is north of the Darling, and west of the Culgoa like the rest.

6471. Do you not connect that spring with any of the systems you have described? I have never seen anything to lead me to connect it with them.

Distance. 6472. How far distant is it from any of the other springs? It is nearer to Nellie Spring than to any other, and about 21 or 22 miles from that. Another spring is the Cuddie Spring, 15 miles south of the Artesian spring. Darling. It contains first-class artesian water, which rises to a height of 6 or 7 feet above the surface, and is about 9 miles east of Mara Creek, in the county of Clyde.

6473. Is that a mud spring? It was originally a mud spring. It is in a hollow 100 yards across or more, and in the hollow a well has been sunk to a depth of 28 feet. Great difficulty was experienced in sinking the well, owing to the way the sides fell in, but timber was used to keep up the sides. The water now trickles over the top of the timber, which is several feet above the surface of the ground. In bad seasons the stock have been taken to that part of the run, and the water has been led into troughs, at which the stock were watered.

6474. Is that spring on private land or on a reserve? It is on a reserve.

Quality. 6475. Is the water good? It is beautiful soft water.

6476. What size is the well? I should think 4 or 5 feet square, or a little more; it is the usual size of a square well.

Supply. 6477. Is there much of a supply? There has been an inexhaustible supply.

The Ginget. 6478. Do you know of any other springs south of the Darling? I do not know of any in which the water rises over the surface. The Ginget is a watercourse extending from the Macquarie River in the vicinity of the Macquarie Marshes to Mara Creek, which it joins about 5 miles distant from the junction of Mara Creek with the Darling River.

Source of underground current. 6479. That underground current you speak of from the Macquarie Marshes—do you suppose it comes from the water lost from the Macquarie? I do not see any reason for thinking that it does not; we have no evidence that it does except that the water is there.

Wells. 6480. Have any wells been sunk? Yes, continually along the course.

Result. 6481. With what result? With the result of obtaining water at a depth of 20 feet.

Rise. 6482. Does the water rise at all? That I cannot say; I do not think it does.

Quality. 6483. Is it good water? It is beautiful water. In sinking the well, drift sand was reached at some distance from the surface, but a box was put into the drift and any amount of good water was obtained.

The Ginget. The utility of putting dams into the Ginget seems to be that the dams retain the water for a long time over the sponge, so that it becomes thoroughly saturated. I look upon the part of the Ginget from which the water is drawn as a great sandy sponge.

6484. You know of no other place south of the Darling where we could look for artesian water? I do not.

Quality of spring water. 6485. Is there any difference in the water of the springs in the various lines you have described in your evidence to-day? So far as I know, the water in all of them is the same, and it has the same effect on the human system.

6486. Then what reason have you for thinking that they form various lines or series? That is only an opinion I have formed from considering the matter, and I have heard nothing that contradicts it.

Series of springs. 6487. You cannot trace one series of springs by one kind of water and another series by another kind of water? No, not so far.

Wells. 6488. Do you know of any other wells of importance north of the Darling? I do not know of any other wells to the east of the Paroo. There are wells to the west of the Paroo, but I have not particulars of them.

Basin of Darling. 6489. You are well acquainted with the basin of the Darling, are you not? Pretty well.

Weirs. 6490. Do you think it is possible by means of dams to fill the bed of the Darling in time of flood? Yes, I think it is possible by means of weirs.

Position. 6491. I suppose the most suitable places to put those weirs would be where the bars of rock are? Yes.

Ana-branches. Warraweena. 6492. Do you know of any ana-branches that would be filled by that means? Yes, in addition to those that have been mentioned to-day, the Warraweena Billabong is an important feature. There is a peculiar and noteworthy feature in connection with that billabong. At Warraweena head station there is a great sheet of water in ordinary seasons, and water has been conserved by means of dams. The peculiar feature to which I want to call attention is, that what is a large sheet of water at the upper end joins the Darling by a puny narrow channel. This seems to me to get rid of the idea that this billabong was ever an old bed of the river.

Storage. 6493. That billabong offers natural facilities for storing water to a large extent? Very great facilities.

6494.

Mr. E. Macfarlane. 23 May, 1885.

6494. What is its length? It is at least 20 miles long.
6495. And throughout its whole length the bed is of sufficient size to store large quantities of water? Throughout two-thirds of its length.
6496. And dams could be easily made for that purpose? Yes.
6497. And if there was a dam near the off-take, would that fill the ana-branch in ordinary floods? Certainly; it fills in ordinary floods now. The thing is to retain the water.
6498. What is the average width of the billabong? About 3 chains. Width.
6499. Is that at the top? Yes.
6500. What would the width be about half-way up the bank? About a chain and a half. The bottom is fairly round. Bottom.
6501. What is the average depth? I dare say it is as much as 20 feet. Depth.
6502. Are there any other billabongs you could point out as being suitable for storing large quantities of water along the Darling? I do not know of any other very big billabong. In a great flood the water breaks out above Moculta Station on the Dry Bogan, and then goes down away by the back of Bourke, and joins the Darling 6 or 7 miles below Bourke. Dry Bogan.
6503. How far does it keep out from the river? At the widest part not more than 4 miles. The railway goes over that. The Railway Department will not make an opening in the railway more than 10 chains wide, so that when the water comes down I believe it will be directed into the openings, and after a few floods we ought to have a big billabong from the scour through the railway bridge. Railway bridge. Scour.
6504. Have you any information as to the water that breaks out of the Dry Bogan at the model huts? Only that it breaks out and goes through the country 10 or 15 miles out from the Darling, and joins the water that has just been described as breaking out of the Dry Bogan. Model huts.
6505. You cannot specify any particular billabong to which you can direct the attention of the Commission particularly? Only those two—the Dry Bogan and the Warraweena Billabong.
6506. Do you think that if the bed of the Darling were filled with water, there are places where the water could be diverted into those billabongs and permanent water conserved at all times? I think so. Diversions from Darling.
6507. Without injury to the banks of the river? Yes; provided the weirs were not made too high. Banks.
6508. What would you call too high? If you came within 10 feet of the top of the bank that would be too high. Height of weirs.
6509. What is the height of the bank above the river? About 40 feet as a rule. I do not think it would be safe to go within 20 feet of the top of the bank. Bank.
6510. Why do you think it would be unsafe? Because not only is the earth very friable, but when the water gets 20 feet up it comes down with great velocity, and the scour would be tremendous. Scour.
6511. But supposing the river were filled in flood-time, would the scour be greater when it broke out into the billabong than if it kept the river channel? No; because when it reaches a certain height it usually flows into the billabongs.
6512. Have you ever thought much of the possibility of diverting the river water by means of canals into the interior of the country in times of flood, or when the water is dammed to a certain height? I think it is quite possible to a limited distance. Canals.
6513. And do you think an off-take could be made from the river and directed so that it would not scour to any great extent? Yes, by selecting favourable sites. Off-take.
6514. Have you any idea where the underground water is likely to be found to the north of the Darling—I mean artesian water? None; except in connection with what I believe to be waters connecting the various lines of springs. Underground water.
6515. Is there anything else you can suggest to the Commission which I have omitted to ask? I have here a tracing which shows the general features and the rise and fall of the country in the vicinity of one of the most important of the springs—the Kullyna; and it also shows the course the water takes in trickling from the spring as well as the reservation surrounding the spring, and the mode of reservation adopted in such cases, the area being 640 acres. I have also another tracing showing the Leila Spring and the reservation around it. Country about Kullyna.
6516. All the plans you have there show the same characteristics and the reservations of other springs? Yes.
6517. And you will supply tracings of them to be appended to your evidence? Yes. (*Appendices* X 1, X 2, *and* X 3.

MONDAY, 25 *MAY*, 1885.

At Goonery.

Present:—

MR. GIPPS, C.E., | MR. LYNE, M.P.,
MR. MURRAY, M.P.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. Henry William Ford was examined:—

Mr. H. W. Ford. 25 May, 1885.

6518. *President.*] You are foreman of water-augers? I was, on this line.
6519. Who is now? Mr. Wright.
6520. What position do you hold? I am foreman of water-augers still, but I have not got any augers.
6521. Has Mr. Wright superseded you? No; he relieved me of the augers. My work is independent of him, and my communications are direct with Mr. Henderson.
6522. Did you put this drill down at Goonery? Yes. Drill at Goonery.
6523. What depth? 200 feet 8 inches. Depth.
6524. At what depth did you strike water? Salt water at 20 feet. Salt water.
6525. Did you pipe that out? Yes; the salt water was carried on to 63 feet. At that depth we struck a bed of clay perfectly dry. At 80 feet we came into rotten sandstone and then struck artesian water. Clay bed, artesian water.
6526. How much deeper did you go? We bored to 201 feet.
6527. What through? Sandstone and shale with clay seams. Strata.
6528. Where did you get the greatest supply of water? We got a little all the way down. The first at 80 feet; the second at 100 feet; the largest at 122 feet 6 inches. Supply.

Mr. H. W. Ford. 23 May, 1885.

6529. Then what? At 192 feet we came into a big gravel bed of granite pebbles.
6530. Did you get any water in that? Yes.
6531. When you struck the water, did it rise to the surface at once? At once.
Rise. 6532. From the first level? From 80 feet. I screwed on pipes and proved it to go 20 feet high, and it was running at that height as freely as at the surface.
Formation. 6533. This is a cretaceous formation? Yes; from 63 feet.
6534. At the bottom you got into granite? We drilled 8 feet into it. It was considered to be the bed rock, and there we stopped.
Discharge. 6535. What quantity did the well discharge at first? When first struck it carried 600 gallons, and kept at that for a month.
6536. What was the cause of the reduction? It was like breaking into a reservoir, in which the gases forced the water up until it got vent.
6537. At the end of the month it was reduced to what? It slackened to 400 gallons.
6538. How long did it keep at that? Twelve months.
6539. What is the flow now? 270 gallons.
Reduction. 6540. What is the cause of the reduction? Partly from leakage in the pipe, and partly from sediment accumulating in the bore-hole.
6541. What requires to be done to make it secure? A new pipe to be put in on the top, and rods and augers to clean out the well.
Bore-pipe. 6542. What depth is the bore-pipe? 112 feet.
6543. And the rest is in its natural state? Yes.
6544. Why was it not piped all the way down? Because it was considered the hole would stand. If it had been piped to the bottom some of the water would have to come up outside the pipe.
6545. But a pipe would have prevented the bore from choking? Yes; and the pipe could be perforated at the different levels of the water to allow it to flow in.
Cost of cleaning 6546. What would be the cost of cleaning it out? About £20.
Cause of rise. 6547. Having had a long experience here, what is your idea as to the cause of the water forcing itself over the surface? It goes under the surface at a higher level than here—probably in Queensland—and there is an underground channel of water all through this country, and when tapped it will rise pretty well to the level at which it went into the ground, allowance being made for friction.
Cause of boring. 6548. What caused you to put down the bore here? Mud springs.
6549. What caused them to show? The granite coming so near the surface causing the water to be forced through the weak points in the clay.
Execution. 6550. When did you commence this bore? In September, 1883.
6551. How long did it take you to perfect it as we see it now? A little over two months, not counting the drilling into the granite, where I made only an inch a day.
Supply. 6552. It has been running ever since? Yes.
Auger. 6553. What auger did you use? The Tiffin down to 112 feet; Wright and Edwards' afterwards.
6554. Why did you not use the Tiffin all the way? It would not work as well as the Wright and Edwards'.
6555. Do you know any auger superior to those? I do not.
Diamond drill. 6556. Why did you not use the diamond drill? I never worked one. In rock they are superior to anything, but in this class of drifts I think the Wright and Edwards' superior to anything.
Second bore. 6557. When you finished the bore at Goonery, where did you go? 6 miles further on.
6558. When did you start the bore there? 4 February, 1884.
Depth. 6559. To what depth did you sink? 545 feet 6 inches.
Rocks. 6560. What rock did you go through? From 150 feet, sandstones, clays, and shales.
6561. The same formation as this? Yes, cretaceous clays and shales, with now and then bands of hard silicious rock.
Depth to water. 6562. At what depth did you get water? At 23 feet very salt water, and at every few feet to 110 feet similar water; brackish water at 350 feet, which rose over the surface. At 428 feet we struck fresh water, which also rose over the surface. A little more fresh water was got at 464 feet. There was no further water to the present depth.
Formation. 6563. What are you in still? Cretaceous shales and sandstones.
Bottom. 6564. You never went to the bottom? No.
6565. Why? I was ordered to stop.
6566. For what reason? That I was already too deep for the machine or the power of its gear.
6567. When did you finish? At the latter end of last March.
6568. That was fourteen months? Yes.
Delay. 6569. What was the cause of the delay? Mainly arising from the difficulty of getting horse-feed, from our having to make tanks for water, and to clear the road.
Tanks. 6570. Where did you put down tanks? At the bore, to catch water when it should rain.
6571. Would it not have been better to have carted water from here? We did.
6572. Would it not have been better to do that without sinking tanks? There was not enough horse-flesh.
6573. Everything was provided by Government? Yes.
6574. Did anything else prevent you from getting on? Nothing, barring the delay in getting things up from Sydney.
Breakages. 6575. Were you stopped by breakages? Several times. We had to send for duplicates of breakages to the Department of Mines, and for tools in place of those worn out.
6576. Were you not supplied with duplicates? Not of some things.
Duration of work. 6577. Suppose you undertook a contract to put down a well, and could use your own discretion as to having things just as you wanted, duplicates or triplicates, how long do you think it would take? About five or six months.
6578. Why? I would have had duplicates of everything that was likely to break.
Work per day. 6579. How much did you put down a day, working on sandstone? 4, 5, and 6 feet.
6580. How much on the clays? 37 feet, 22, 23, 10, 16.
6581. Why would it take you five months to do it? You do not know what delays you may get in clearing out water.

6582.

Mr. H. W. Ford.
25 May, 1885.

6582. How do you clear the water out? Bale it out with a valve bucket. That was one thing that delayed us at the 546 feet 5 inches bore.
6583. If you had appliances to pump the water quickly would that take long? No.
6584. Do you know that there are persons communicating from America, who guarantee to put down 200 feet a week? I do not; but it is quite possible to do so if you work two or three shifts. I have put 103 feet down on this well in four days with one shift; that was working from the surface downwards.
6585. Suppose you had as many shifts as you want, and all the appliances necessary, how long would it take you to put down this well at 57 miles? We should average 20 feet a day.
6586. About a month in round numbers? Yes; I speak of this country I know.
6587. What quantity of water does it take to work these augers? Very little indeed; the slops from the camp work them.
6588. Then it is possible to cart the water? Yes; that is where they have the advantage over the diamond drill, which cannot be worked without water. They work better if they have water, and artesian water helps greatly in clearing the drillings. Water.
6589. What quantity of water would it take to work the diamond drill? I cannot say. I used the Tiffin first, because I could tube back the drifts and swelling clays, and salt water.
6590. Why was the 57-mile site selected? Because it was supposed to be pretty good, and a fair distance considering the carriage. Site.
6591. Are there any springs on the surface? No appearance on the surface, only cane-grass flats and clay-pans. Springs
6592. Have you any idea of the distance east and west that carries running water? I have not; I think all this country until you get upon the silurian formation towards Mount Brown carries water. Running water.
6593. Have you any idea of the direction in which this water is flowing? I think from north-east to south-west, by the course of the mud springs. Direction.
6594. Why? Because north-east from Goonery there are mud springs at 10 miles—one dry one; further north-east are active ones to near Queensland borders; about 40 miles south-west there are also mud springs known as Wee Wattah and Mulyeo, on Kallara station. Mud springs.
6595. Are they dry? No. There are artesian wells at both, put down by Mr. Brown, Mr. Officer's Manager.
6596. Have you any particulars of it? No; but the particulars are in one of the publications of the Mines Department—Mr. Brown's report on the Albert Gold-field.
6597. What quantity of water is there flowing from the 57-mile bore? 106 gallons an hour. Supply.
6598. Has it ever been greater? Yes; it was 135 gallons.
6599. How long did that flow? I could not say exactly; it has not been gauged for a long time.
6600. What is the reason for the decrease? I do not exactly know, unless it is that the pipes or cracks in the rock have been obstructed by sediment where the water flows in. Decrease.
6601. If the pipes were perforated and driven down to the bottom, would that keep out the sediment? In the 57-mile bore the pipe is only 157 feet down. Pipes.
6602. What is the nature of the bore between that and the water? Cretaceous clays and sandstones, and hard silicious bands. Formation.
6603. You did not commence with a large enough tube? We commenced with a 5-inch tube. We could not put down smaller tubes until we had finished the bore, as the boring tube is 4½ inches in diameter. Tube.
6604. Why? Mr. Henderson told me to leave the bore so that the diamond drill could continue it, and not to shut off artesian water.
6605. You think it would be a good plan to use perforated pipes at the inflow levels of the bore? It would assist greatly in keeping the well open. Perforated pipes.
6606. Do you know anything of the bore which is being sunk further out? No, except that it is over 100 feet. 75-mile bore.
6607. Who selected the spot? I did.
6608. How far is it from the 57-mile bore? 18 miles. It is at 75 miles, on the road from Bourke to Wanaaring.
6609. Are there any surface indications of springs there? No. Surface indications.
6610. Has water been struck? Salt water, at 11 feet. Salt water.
6611. Have you been there since they started? No.
6612. Is there a tank at 75 miles? A small one. Tank.
6613. Was there any necessity for it? Yes; there is no other water.
6614. How long would a 400-gallon tank last the men at work? About a week; not that sometimes. Efficiency.
6615. Are there any other bores out on that road? No; there is a site for one further on, at 95 miles, on the other side (W.) of Kulkine Creek.
6616. If there is underground water throughout that country, would not one place for a bore be as good as another? Yes; the sites are selected to meet the requirements of traffic upon the road. Selection of sites.
6617. You have partly sunk a bore between Goonery and Bourke? Yes; 198 feet 4 inches. Bore.
6618. What did you go through? 20 feet of rock from the surface down; under that, sandstone and clay. Strata.
6619. How far? Down to 193 feet; then I got sandstone conglomerate. Depth.
6620. Did you get any water? Fearfully salt and bitter water from 11 to 147 feet. Supply.
6621. You are making a tank there now to enable you to go deeper? Yes. Tank.
6622. If you had the augers or drills that you might require, could you not go on with that now? Yes; we are preparing a tank now.
6623. How far have you to go from there to get water? About 4 miles. Distance to water.
6624. Could you not work it from that? I did while there was water and grass.
6625. It could be worked from that tank altogether? I think so.
6626. If you strike good water in the bore will the tank be of service? Yes.
6627. How far is the tank from the bore? 20 yards from where the bore is down now 198 feet. If the diamond drill is brought out, the water in the tank will be very useful to work it. Distance to bore.
6628. Is it the intention of the Government to erect a tank at Goonery? Yes. Tank.
6629. What sort of tank? Iron.
6630. To contain how much? I hear 20,000 gallons. Capacity.
6631. Will that be expensive? I do not know. The plates are there. Cost.
6632. What is the object of it? To hold a supply for watering stock. 6633. Object.

Mr. H. W. Ford. 25 May, 1885.

6633. Is not the tank now here sufficient to supply travelling stock? Yes, any stock that is likely to travel.
6634. Then there is no necessity for any other tank? No.
6635. *Mr. Murray.*] This bore could be turned into a shaft? Yes.
Supply. 6636. And give a very large supply? Not any larger supply than from the pipe.
Pipe. 6637. Your pipe is 4 inches? Yes.
6638. When you first tapped the water the pipe carried more than now? Yes; it would carry a great deal more if there were pressure on it.
Pressure. 6639. Would not the pressure that forces it through a 4-inch pipe force it through a much larger conduit? Yes, but not in larger quantity; a shaft would give a larger receptacle to bale from.
Shafts. 6640. *President.*] Has any shaft been sunk in this district? Yes, not far away from here.
6641. Would not a shaft in a place such as this be less likely to get out of order than a pipe such as you have now? No; there would be greater space for the sand to come in between the slabs.
6642. If properly slabbed and puddled, would there be any danger of the sand coming through? The shaft to which I refer has been puddled, and has been in use for some years, but still the sand comes through.
Capacity of dam. 6643. Do you know the capacity of the dam erected on the station? It is 1,060 yards.
6644. Does it hold water still? Yes.
Depth. 6645. What depth is it? 3 feet 9 inches.
Adequacy. 6646. Would not a dam here answer the purposes required as well as an iron tank? Every bit; it has answered all purposes for fifteen or sixteen months.
Capacity. 6647. What is the general capacity of the small tanks you sink beside the bores? 150 to 200 yards.
6648. These may be utilized afterwards for other purposes? Yes; but their immediate use is to enable the boring to be done.
Stock watering. 6649. If the bores were completed, there would be a necessity for larger tanks to water stock? Yes.
Stock route. 6650. Do you know of any other place than this road to Wanaaring where it would be suitable to put down a shaft for travelling stock? This is the only stock route that I know of in this district.
Cheap bores. 6651. Could you suggest any means for putting down the bores that would be cheaper than the present system? A cheap plan would be to have various sized tubes, and one machine to work them.
Machine. 6652. Which machine would be the best for the purpose? Wright and Edwards'.
Silt. 6653. *Mr. Gipps.*] We see that the water is perfectly clear as it flows from the pipe, that there is no deposit of silt in the basin, and yet we know that there is a pressure of 86 lb. per square inch, which ought to be quite sufficient, if there was any silt at all, to force it up: do you say that there is silt accumulating from below? I imagine that it gets down below the main supply, which rises from 122 feet.
Quality. 6654. Is the water good enough from this Goonery bore for stock to drink? When once stock take to it, they leave all other water to get it.
6655. As to the water at the 57-mile bore? It is only fit for stock.
6656. Will vegetation grow near it? Cane-grass only.
6657. Does it encourage vegetation? No.
6658. Does it give any deposit? Yes, salt.
Rainfall and supply. 6659. Does the rainfall affect the supply of water from the bore? Before rain there is usually a bigger flow, which I take to arise from the pressure of the atmosphere.
Spring. 6660. From that you would infer the water comes from a spring? Yes; the mud springs seem to show more water before rain.
Soil. 6661. Do you consider this permeable soil? Yes.
6662. Therefore an iron tank would save more of the water than would be saved if the storage was in the soil? The station tank was calculated to fill in eighteen days; it actually took twenty-one, so that the soil is almost impermeable.
Service pipes. 6663. *President.*] How high is the service-pipe at the Goonery bore? 10 feet.
6664. Have you tested the bore by higher pipes? Yes, to 21 feet, and it would flow at a higher level.
6665. As to the 57-mile bore? It flows at 3 feet, and will rise as high as 6 feet over surface, and still higher.
Source. 6666. Do you consider that it comes from the same source? No.
Surface levels. 6667. What is the difference in the height of the surface level of the two wells? 25 feet.
6668. Would not that account for the difference in the height of flow over the surface? No.
Artesian water. 6669. Could artesian water be obtained in any of the country here? In most of it.
Underground channels. 6670. Does the water flow in underground channels, or is it spread under a large extent of country? I think the main water flows in channels, but I think there is water all through the cretaceous beds.
Fossils. 6671. Did you ever find any fossils in any of these wells? Yes.
6672. In Goonery? Yes.
6673. You sent them down to the Mines Department? Yes; I also found them at the 57-mile bore.
Shaft. 6674. You have stated that there was an open shaft in this district? Yes, within half a mile of this bore.
Object. 6675. What was the object in sinking the bore here? To procure water for travelling stock—not to test if water could be obtained.
Dam. 6676. Have you known the dam at the crossing of the Warrego for any length of time? Over two years.
Depth. 6677. What depth of water have you seen in that dam? Where the stables are the depth is 10 feet; in other parts it is shallower, and in others again a little deeper.
Supply. 6678. How long have you known that water to lie without receiving an additional supply? Eighteen months.
Stock watered. 6679. During that time have stock been watering at it? Yes, immense quantities, both of travelling and station stock.
Exhaustion of supply. 6680. Do you think that the decrease in the supply at Goonery and in the 57-mile bore arises from the exhaustion of the supply? No, unless a little from drought at the heads of supply.
Small bores. 6681. If there is such an extensive underground storage as you suppose, would small bores such as you have put down have any effect in reducing it? I do not think so.
Dam. 6682. How long have you known the Goonery station dam? I saw it made, in February, 1884.
6683. Have you ever known it to become dry? Never.
6684. Is there much stock watered at it? Yes.
6685. How deep is it? 3 feet 9 inches. It is supplied with water from the bore.

MONDAY,

MONDAY, 25 *MAY*, 1885.

At Bourke.

Present:—

MR. BARTON, M.P., | MR. FRANKLIN, C.E.,
MR. M'MORDIE, M.I.C.E.

F. A. FRANKLIN, ESQ., C.E., IN THE CHAIR.

Mr. Frederick William Mackay called in and examined :—

Mr. F. W. Mackay. 25 May, 1885.

6686. *Chairman.*] You are at present a resident in Bourke: how long have you been here? Twelve or thirteen years.

6687. I suppose you are acquainted with the district generally for a considerable radius outside the town? No, I have travelled very little out of the town.

Floods.

6688. During the time you have been resident in Bourke have you observed any very high floods? Yes.

6689. Do you remember the dates of the highest floods? I came here about 1870, and there were very high floods about that time; in 1873 especially, as far as I remember.

6690. You have reason to remember that time particularly? Yes; at that time preparations were being made for banking the houses here—men were employed in raising small embankments.

6691. Do you remember if any permanent mark was made at that time of the highest portion of the flood on the banks? I am not aware.

6692. You do not remember any fixed feature which might be referred to as the flood-level of that date? No; I know that the water came down the street nearly as far as the old Commercial Bank of that time, and the town was surrounded by water. I had occasion to go past the Hospital on the road to Cobar, and I went for 2 or 3 miles through water 2 or 3 feet deep.

Irrigation.

6693. You, I believe, have assisted the growth of your own grounds by irrigation? Yes.

Well.

6694. Do you obtain the water from a well? Yes.

6695. How is that well constructed? It is of slabs.

Depth.

6696. At what depth do you find the water? At a depth of 45 feet.

Strata.

6697. What are the strata in which you find the water? Sand-drift.

Rise.

6698. On touching the water I suppose you find it immediately rises through the sand-drift? Yes.

6699. Did you never attempt to reduce the water so as to get to a lower depth? No; we found 5 feet of water ample.

Size.

6700. And what are the internal dimensions of the well? 5 feet by 5.

6701. That is 15 cubic feet to the foot? Yes.

6702. Something like 100 gallons to the foot? Yes.

Wind-mill.

6703. What means do you employ for raising the water? A windmill—the Althouse.

Power.

6704. What is the power of the mill? It is a 10-foot mill.

Pump.

6705. What pump do you use? It is a Douglas pump; it pumps from 300 to 400 gallons per hour with a fair wind.

6706. Do you find that the water keeps to its level of 5 feet? Yes.

Supply.

6707. So that you are pumping on about 500 gallons of water? Yes.

6708. How long can you keep your well working without exhausting it? I believe it will work two hours without being exhausted, and if it is allowed to rest half an hour, or even less, it fills again.

6709. So that your well is again charged by percolation through the sand? Yes.

6710. Have you heard any complaints that by excessive pumping you reduce the level of the water in the other wells in your vicinity? Yes.

6711. So that you have been led to believe that all these wells will be charged again after a certain time? Yes.

6712. Do you think then that by an increased depth in the well you would be able to hold a supply which would keep your pump going continuously throughout the day, and replenish it continually at night? Yes.

6713. And as many wells as might be sunk in the surrounding neighbourhood? Yes, at a sufficient depth.

Distribution.

6714. How do you distribute the water you so raise? The water is stored in an iron tank, and then by means of a hose conveyed to different parts of the garden.

Storage.

6715. The object of storing in the iron tank, I suppose, is to keep the water at the temperature of the earth? No; to provide against a very calm day when the wells will not work.

Effect of well-water.

6716. Do you find it detrimental to vegetation to put the water immediately from the well on to the land? No, I find no ill effects from it. The water is put on very often direct from the well. The custom is to water in the early morning and evening.

6717. And you think the water may be taken at all hours from a well of that depth, and placed immediately on the land? I have seen no ill effects from it in my garden.

Temperature.

6718. Have you noticed that the water is of a very high temperature at some times in the well? No, it is of a uniform temperature, I believe—I never remarked any difference.

6719. Did you never remark that sometimes it is much higher than the water in the tank? There is a difference in the temperature of the water in the two places; in the tank the water gets very hot.

6720. But does it not get sometimes very much colder by standing in the tank? It depends upon the weather.

6721. I am referring particularly to the summer-time? No; it gets hot in the iron tank, I have always found.

Soil.

6722. What is the nature of the soil in your garden as compared with the general soil of the district? It is heavy black soil, the same as that about Bourke.

6723. If you were to plant in the soil in its natural state, depending upon the rain of ordinary seasons, could you cultivate? No, I think not—I am sure not.

Tree-growing.

6724. With the assistance of water you have been very successful in growing trees? Yes, and shrubs and flowers, also a little patch of lucerne.

6725. Will you describe what you have grown with the assistance of irrigation? Principally trees; pepper trees, the Queensland silky oak, the blue gum, the currajong, a plane tree, also two white cedars. They have all grown very successfully.

Mr. F. W. Mackay. 25 May, 1885.

6726. And you have also planted a tree fern? The tree fern has only been planted within the last two months.

6727. But it is growing vigorously? Yes, strongly and beautifully. Roses, I may mention, I have found to do very well.

6728. And you have succeeded in laying grass lands with couch grass? Yes; we tried a small experiment with buffalo grass, but it died, except where immediately watered.

Crops. 6729. After this practical test, are you of opinion that with an enlarged system of irrigation over a large area you could succeed in growing any amount of crops here? My experiments have been confined to ornamental trees, and shrubs, and flowers; but no doubt the Chinamen's gardens here are a proof of what can be done. Tim Yang irrigates from his well with a Tangye steam-engine, and there is a Chinaman who irrigates from the river by means of a pump; both of them have been very successful.

Size of fruits. 6730. Is it not a fact that in growing fruit the sizes attained are of unusual dimensions? Yes; the oranges are of a very fair size. Fruit trees are grown very successfully. I have grown peaches, grapes, and mulberries. The mulberries only were spoiled by dust-storms. Grapes are liable to be spoiled if not sheltered from the hot westerly winds.

Area. 6731. What is the area of the ground that you have treated? About a quarter of an acre.

Quantity of water used. 6732. Can you state approximately the number of hours per day, day by day, that you have pumped on this ground to produce these results? I think six hours a day during the summer months.

6733. 2,400 gallons per day, you think? Yes; excepting Sundays—there is no water put on on Sundays.

6734. Do you think there is any defect in your system which would cause the waste of any portion of the water? There is no waste that I can see, except a small portion that may be wasted on the paths—that is very trifling.

6735. Then we are to infer that that would be a fair quantity of water to distribute over that area for general irrigation purposes? Yes.

Soil. 6736. Do you know if there is any soil superior to yours in other situations, which would retain the water and irrigate with a less quantity? No, I am not aware of any. I may mention that I had three peach trees that had a larger quantity of water than usual; they bore very heavily last season.

Success of irrigation. 6737. So far as you have observed then, you have found that all those who will assist nature by irrigation are successful in establishing gardens? Yes; we have had excellent peaches and grapes; in fact, some of the grapes were sent to Sydney, and were favourably noticed by the *Herald*; they were the red muscat.

Chinamen's gardens. 6738. *Mr. M'Mordie.*] What is the area of the Chinamen's gardens to which you have referred? I could not say. Tim Yang's, I dare say, is 3 or 4 acres.

6739. Do you know what price Tim Yang paid for the land which he now uses as gardens? I have no idea.

6740. *Chairman.*] You know by rumour that he paid a large price? Yes.

6741. *Mr. M'Mordie.*] What price does the rumour say? There was a rumour that he paid some £2,000 for some land on which was a vineyard, but I do not know how true it is.

6742. Was that for the whole 4 acres? No, that was for the vineyard only.

6743. What would be the area of the vineyard approximately? About 1 acre. However, I cannot be sure—I do not pay much attention to rumours.

6744. *Chairman.*] Do you know the number of men employed in Tim Yang's garden? It varies I believe; on an average there are about twenty—I have seen that number there myself, all Chinamen.

6745. But the garden produces fruit and vegetables almost sufficient for the town I suppose? Yes.

Manure. 6746. Do you find that your land deteriorates in any way by constant irrigation? No; this garden of mine, with a little manure, bears very well—everything grows nicely in it.

6747. In what way do you manure it? With horse manure mixed lightly with earth.

6748. *Mr. Barton.*] Do you use that in preference to any other, or is it handiest to get? It is handiest to get.

6749. *Chairman.*] Are you so satisfied with your labours that you would not hesitate to extend the operations over a large area? I should not hesitate.

Mr. Charles Edmund Goyder called in and examined:—

Mr. C. E. Goyder. 25 May, 1885.

6750. *Chairman.*] You are a resident of this district, are you not? Yes, on the Warrego.

6751. Are you a run-holder? Yes.

6752. What is the name of your run? Pirillie.

Losses. 6753. You have been subject to considerable losses by the late drought, I believe? We suffered like the rest.

Water conservation. 6754. But I suppose you have taken means to provide the station with water for the stock? Yes; we conserve water in tanks and dams, and also by a well.

Expense. 6755. I suppose the conservation of water for stock is one of your heaviest expenses? Oh yes.

6756. What proportion would it bear to the general expense of management for the year—say on a block of 100 square miles? It would cost £1,500 to water it—that would be a fair expenditure for that area. It greatly depends upon the facilities you have for making water to begin with, because you may spend £1,000 in one place and not get as much as you would get for £100 in another place.

6757. What is the area of your run in square miles? 370 miles, I think.

6758. So that we may take it that the cost of watering that run would be about three and a half times the amount you have stated? It would cost more at our place I think, because it is a bad country to make water in; there is a great deal of wear and tear on the dams; a dam made there is not a permanency—you have to be always patching it.

Water-rate. 6759. Now suppose a means were adopted to give you a permanent supply, upon a properly conceived plan, I suppose it would be in your interest to pay a water rate, not to the extent of your present expenditure, but a fairly estimated rate, for the use of such water? It would pay us, presuming we had not already spent this money; but having spent the money, we are to a certain extent independent.

6760. Suppose that by a recurrence of droughts your present catchment could not be supplied for want of rain, and you had a supply at hand, would it be worth your while to pay for the water? Yes, it would be fair to pay a fair interest on the expenditure, and a little more, in time of drought.

6761. Suppose that works of that character were in the vicinity of your run, and the water could be used on payment of a charge, there would be no objection to the imposition of a rate? No.

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6762. If such works were established, what system of management do you think would be best—should it be by local Trusts or by a Board in Sydney? I think it would be better to have them locally managed. Trusts.
6763. So that those interested would have the direction of the distribution? Yes, and you would then get men who thoroughly understand the matter. A great deal of practical experience is required, in addition to scientific theories about water.
6764. What river commands your country? The Warrego. The Warrego.
6765. What is the present condition of the Warrego, after this long drought? Its condition after the drought was very dry. There were three places on the frontage where there was water, but only in consequence of dams.
6766. Where is your run situated with respect to the Warrego? To the north-westward.
6767. Do you conserve the waters of the Warrego at all now? Yes, by means of dams. Dams.
6768. How are they constructed? The earth is excavated and thrown across the channel of the river. Construction.
6769. Are there any dams situated above you? Yes, there are a number of dams between us and the Queensland border. Situation.
6770. Have you had reason to complain of the stopping of a moderate supply of water by the upper dam? No, I find that it is a matter of give and take; sometimes you will suffer, and at other times it will be to your advantage, and I think it is only fair that every one should be allowed to dam in a fair way, but not to stop a river or creek altogether.
6771. Are the crests of these dams carried up to the level of the natural banks? Higher as a rule. Height.
6772. And, in addition, wings are thrown out? Yes; the channel of the river is fully filled, and a wing is thrown out on each side. Wings.
6773. To what distance? It depends entirely on the position. Before making a dam it is necessary to select a place where you can get a by-wash, without having the wings of your dam exposed to the wash of the water. By-wash.
6774. Do not you find these wings throw out a large quantity of water on the flat lands in some cases? In some cases they do; but in selecting a site, you choose one, if possible, where the overflow water leaves the bed of the river at some distance above the dam and runs round the dam at some distance from it, and in again at a point further down; in fact some dams have half a dozen by-washes to them.
6775. Do you think the same purpose would be served if an inexpensive overshot dam could be designed? Yes, but I do not think you could make an inexpensive overshot dam; if you could, it would be the best thing you could do. Overshot dams.
6776. And to have the upper one so arranged that the water might be regulated down to the lower one? Yes.
6777. You would have the main dam overshot? Yes.
6778. And the water regulated so as to give you a supply and prevent any overflow on to the surrounding country? Then happiness would reign supreme on the Warrego.
6779. I suppose it has occurred to you that this should be done, but you do not see your way to do it? No, I do not see my way to do it.
6780. The water at present conserved in the dams is used for stock in the same manner as you use your tanks? Yes. Use of water.
6781. Have you attempted to distribute the dammed water by channels over the back country? No. There is a regular network of creeks on Pirillie, and I have tried to throw water here and there in them. There is one dam used to throw the water out of the Irrara into Green Creek; this creek runs out of the Irrara Creek in a south-west direction and empties itself into swamps, sometimes the very heavy floods reaching the Warrego. Distribution.
6782. Then you have practical proof that, by raising a head of water, it is possible to find a drainage line in a different direction to that of the creek? Yes, I have always found that the level changes in these creeks in a most extraordinary and incomprehensible manner. This dam on the Irrara that throws the water into Green Creek was put there by Sir Samuel Wilson to stop the Irrara and get the water into Green Creek, as that creek never used to run; when it was not there it used to by-wash, and the water still came down the Irrara below it. I put a dam below that on the Irrara, but I find now that all the water goes down Green Creek. I have had to cut the first dam to get mine full. The last time the river ran I was not able to get any water into my dam at all—all the water has gone down the Green Creek. I do not think it is silting, because the Irrara water is very clear always; the change is in consequence of some alteration in the contour of the country. Drainage line. Dam on Irrara.
6783. You had no means of ascertaining the former level before you interrupted the flow of the water? No. Levels.
6784. You have springs on your run, have you not? Yes. Springs.
6785. What is the nature of these springs? They are what are called mud springs—the water comes up through the mud.
6786. Is there any particular feature about these mud springs—are they lifted above the ground in any way? Some of them are, but the ones which have the most water in them are not, as a rule.
6787. *Mr. Barton.*] There is more water and less mud I suppose in some, and in others there is more mud and less water? Yes.
6788. *Chairman.*] Will you explain what means you have adopted to avail yourself of the water of these springs? I put sheep at them just as they were, to commence with. It was always understood that they would carry 10,000 sheep, which of course they did not.
6789. Is not the ground very boggy and loose at the site of these springs? No; they are on the head of Coonbillie Creek. There is an amphitheatre surrounded by rocky mulga ridges. The ground towards the head of the fall is partly covered with rough water-worn boulders, and they are also in the ground, as I have found by sinking.
6790. At present the water is used from the surface? Yes.
6791. How is it got? The source of the springs is through a reed-bed slightly lifted above the general surface of the ground. The water then discharges in an annular basin about 10 feet wide, and the stock can water there without fear of bogging. Stock watering.
6792. Is it a permanent supply? Yes, it is permanent, but limited. Supply.
6793. Have you ever tried to sink a well near the site of one of these springs? Yes. Well.
6794. In what way did you form your well? I tried to sink shafts with slabbing.

6795.

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6795. What was the result? Mud. In one well I got a little water—about 1,000 gallons a day.

6796. Then you are not aware that any one has ever succeeded in getting pure water at the site of the springs? No; there is a well at Goonery, but I do not think it is in the mud. They have never been successful at Coonbillie.

Flow. 6797. Did you ever trace the flow of this water to a lower level in better ground? No, I cannot trace it anywhere out there.

Storage. 6798. And do you think that any means could be adopted by which that water might be clarified and stored? Yes.

6799. In what way? By putting down a pipe until you get the clear water. There is no doubt that there is plenty of water, or it would not be forced up through the mud springs. Not only is there a great deal of water, but there is also a great pressure.

6800. Has a tube well ever been tried there? No, not at these springs.

6801. Nor borings of any kind? No.

Source. 6802. Have you ever formed an opinion as to the source of these springs, whether they arise from the bed of the river or from local soakage? I do not think that the water is supplied by local soakage; it must be collected from some place where there is plenty of it, because there must be very great pressure underneath.

Groups of springs. 6803. What is the extent of country in miles in which these springs are situated? There are three groups of springs. One consists of only a single spring, and has no name; it is at the north-west corner of Glenelg. Then there are Barlungma Springs.

Situation. 6804. These springs are very near the ridge country? Yes; the big, rocky mulga ridge. That is in the south-west of the Mutagoona back block. The Coonbillie Springs are in the south-east corner of Coonbillie block. There are other springs to the east of the Warrego, at Leila woolsheds; they give a big supply. There is another spring to the east of the Warrego, in the same line, below Leila House. A map showing the localities of the springs may be obtained at the District Surveyor's Office, Bourke.

Watershed. Boring machine. 6805. What means would you recommend to prove the extent of this watershed? I should think a really first-class boring machine could cope with all the difficulties; but it must be something better than I have seen up here yet.

6806. And which in your opinion would be the best site to make the boring? I do not think my experience is sufficiently large to enable me to answer that question.

6807. Is there a gentleman out here who has been experimenting with bores for some time? Yes—Mr. Bignell.

Yantabulla Spring. 6808. Mr. Bignell has been more successful than any one else with the bores he has got? Yes. If it were thought well to test the country, Yantabulla, where a township is about to be surveyed, would be a suitable spot—there is a splendid spring there.

6809. Are you aware that that spot has already been inspected by the manager of the boring operations? No, I am not.

Quality. 6810. Generally, so far as you know, the spring water is of good quality, and is fit for all purposes? Yes, I do not know of any spring which is not good to drink.

Supply. 6811. What do you suppose would be the daily supply of the Coonbillie Springs? Not more than 1,000 gallons a day in their natural state—they will not water more than about 1,000 sheep in the summer.

6812. Suppose you exhaust the water during the day, does it make again at night? No, it will not make in very bad weather. You see you exhaust the water in the basin, and a big dust-storm comes up, with the result that the surface of the mud or sponge has a good thick coating of red dust, and no more water goes into it for a bit.

6813. Have you never attempted to protect these reed-beds by building a fence of boughs? No, I did not think it worth while.

6814. Do you find from any ascertained cause a variation in the supply of water in this spring? No, I have seen no appreciable difference.

Well. 6815. Have you by means of wells discovered any underground supply? Yes; I have a well about 50 yards from the Coonbillie Springs.

Size. 6816. What are the natural dimensions of that well? It is a shaft 6 feet by 3 feet.

Slabbing. 6817. Slabbed down as usual? Where necessary.

Depth. 6818. To what depth? Between 35 and 40 feet.

Strata. 6819. What is the nature of the strata through which you passed in sinking the well? Water-worn boulders on the surface to a depth of 7 feet, and there is for 5 or 6 feet a little bit of rock, having pebbles through it, as if it had been crushed into one mass—a conglomerate. Then you have the water.

Quality. 6820. What is the nature of the water? Very salt. It is good stock water as we call it, and that is all.

6821. Did you shut it out? No; I wanted it.

6822. Then you went to a greater depth? Yes, until I could not keep the water down. It was the same water all the way; it was in a compound of chalk and pipeclay.

Supply. 6823. You made no attempt to get below that water? No. There is a good supply there of about 6,000 or 7,000 gallons, which sheep will drink when they get used to it.

6824. Did you ever exhaust that well? I have never used it; it always rains when I begin to use that well.

Shaft. 6825. Have you any other wells in the neighbourhood of it in which you find fresh water? No, except a shaft in Barlungma Springs. There are about 1,000 gallons a day obtained from it. It is 20 feet deep, and the water is found in a brown rotten stone which appears to me to be like solidified mud.

Supply. 6826. And if you were to draw in excess of that quantity per day the shaft would become dry? Yes.

6827. And by percolation would fill again? Yes.

6828. In what time? About eight hours, I think.

6829. Then there would be about 3,000 gallons in twenty-four hours? No; the shaft scarcely holds 1,000 gallons of water; it is a very little shaft. It would not yield more than 1,000 gallons in twenty-four hours. I have never tried it, so that it is merely a matter of conjecture.

6830. It does not offer you sufficient inducement to sink a larger well? No; I used to use it mostly for horses.

6831. Have you any other wells on your run which are more successful? No.

6832. *Mr. Barton.*] Does it strike you that the water in this well has anything to do with the mud springs? It is a different supply altogether—quite different water, and on a different level; the well is on a hill.

6833. Do you know the source of the Warrego? Not at all. Mr. C. E. Goyder.
6834. You have tanks in various positions over your run? Yes.
6835. And do you find generally that the land is retentive? Yes, if you are very successful in picking a place, but I find great difficulty in getting down; you get 8 or 10 feet of clay and then salt water; I have put down as many as eighteen shafts before I got a piece of clay deep enough to put a tank in. 25 May, 1885. Tanks.
6836. Your tanks have been recently filled, have they not? Yes, most of them.
6837. Do you attach any kind of gauge to your tanks to ascertain the loss by evaporation, soakage, &c.? No; I have no idea what the evaporation would be, but I may say that, as far as my experience goes in that country, if you can get suitable places to make dams they are the best—they are better than tanks. The water contained in tanks does not last like water in dams. It is wonderful how the dams hold out in the drought. The dam at Willyeuroo stood all through the drought. Evaporation. Dams versus tanks.
6838. *Chairman.*] Do you think there is a great waste of water in the first charging of the rivers, from the fact of the beds being dry, a great deal of soakage taking place? Yes, especially in big creeks—more than in the rivers. Soakage.
6839. Then, in designing a system of dams, it would be of advantage to keep the beds always moist, if possible? Yes, decidedly.

Mr. Thomas Topham called in and examined :—

6840. *Chairman.*] You have lived in this district a length of time? Yes—twenty years. Mr. T. Topham.
6841. And your experience has taken you over the system of rivers in this district? Yes.
6842. Taking Bourke as a centre, within what radius can you give us any information up and down the rivers? I have been pretty well round the Wilcannia district, and up from there to the Namoi and the head of the Bogan—all round the Narran, Paroo, and Warrego. 25 May, 1885.
6843. You are acquainted with the formation of the Darling generally as far as the Namoi? Pretty fairly. The Darling.
6844. On both banks? I have been on both banks, in both floods and droughts.
6845. You know there are very large billabongs on this river? Yes. Billabongs.
6846. Do you know any billabongs such as the Cato Creek on the Barwon, and a series of billabongs of very large extent on the north-western side of the river? Yes.
6847. Do you know if such billabongs or depressions exist on the south-east side of the river? Yes, there are some smaller than those on the other side.
6848. Can you particularize any large billabongs on the south-eastern side, between the Namoi and Bourke? Not on this side; all the way down from Walgett to Brewarrina on this side it is one extent of flat country.
6849. You do not know of any deep depressions? I do not know of any particular ones. I have ridden over the country right across from Walgett to Canonbar, and it was all under water.
6850. Do you know that the principal creeks discharging into the main river are comparatively flat? Yes, there is no fall.
6851. You have seen the dams fixed on most of them, and know the nature of the dams? Yes. Dams.
6852. You are aware that these dams throw the water back for a long distance with a slight elevation in the dam itself? Yes, 6 or 7 miles. Back-water.
6853. What height of dam would be required to do that from the bed of the creek to the bank level? 20 feet. Height of dams.
6854. Then a rise of 20 feet only throws the water back 6 miles? Yes.
6855. But that is contrary to the evidence you gave just now that there was no fall in the creek? The site chosen for the dams is generally a very favourable spot, where there is a bit of a channel, perhaps the site of a waterhole. Site.
6856. Then, when you say 20 feet, you mean that that height would be caused by the dam being situated in a depression? Not altogether, but by being above the surrounding country.
6857. Do you not think it a disadvantage to throw water on to a flat country at the side of the creeks? Yes, because you simply keep it there for waste. Inundating flat country.
6858. Do you not think it would be an advantage to build overshot dams at a lower level, and at more frequent intervals—would not they retain permanent water? They would if properly constructed, and sufficient money were expended in making provision against their being carried away, but I have seen so many on which a lot of money has been spent, and which are perfectly useless. Overshot dams.
6859. Have you seen any successful overshot dams? Yes; there is a very good overshot dam at Dumble, and there is another just below that, at Mr. W. Doyle's station, Muckrewagh.
6860. Can you describe the construction of the dam? It is made of ordinary timber, I think clear pine, and it is considerably below the level of the top of the bank. Construction.
6861. What would be the height from the bed of the creek to the crest of the dam? I should think certainly not more than 12 feet, standing on the bed of the creek. Height.
6862. Can you describe the construction of it—how it is framed up? You can get a description of it from Mr. Francis Bacon, the partner with Wright, Heaton, owners of Dumble Station. There is another dam on Charlton Station on the Bogan, a very successful one; it has stood for years.
6863. Where can we get a description of that dam? From Mr. Russell Barton, or Mr. Macintosh, the manager of Charlton Station.
6864. Do you think that, with proper surveys and examination, a general system of water conservation could be carried out superior to that of private enterprise? Yes, most decidedly. Water conservation.
6865. And you think that very great improvements might be made on the present system? Yes, very easily. Improvements.
6866. Do you think the present system by private enterprise is carried out to the fullest extent? No, not to the fiftieth part.
6867. Do you know of any reason why greater exertions are not made, or have not been made? Yes, I think so.
6868. What are they? Security of tenure for one thing; another reason is that the stationholders, as a rule, do not hold their stations more than four or five years. Those who are more successful hold them for a lifetime, but the majority of men keep them only five or six years, and run up everything as cheaply as possible. Security of tenure.

Mr. T. Topham. 25 May, 1885.

6869. Then you think the means employed by them could be greatly improved upon so as to bring about much more satisfactory results? Yes, I am sure of it.

Diversions.

6870. Can you yourself suggest a better means of conserving water? I think there are endless instances where you could find out where you could divert the streams in this flat country, and spread the water, instead of allowing it to run down into one channel in the Darling.

6871. In what way would you do that—would you raise the ordinary water level in the rivers? I would retain the waters to nearly two-thirds of the flood level, so as not to throw it on to the flat country.

Natural depressions.

6872. Do you know, from your great experience in the district, that there are natural depressions in the valley of the Darling which could be formed into reservoirs for the catchment of the great flood-waters? Yes, I do.

Storing flood-waters.

6873. Then you think that, by a close examination and survey of the river system, portions of the high floods could be held back and afterwards liberated at will? Yes.

6874. Are you prepared to mention any exact localities? I think that if a lock were put at the junction of the Bogan and the Darling it would drive the water back for miles in the Bogan River, and Dry Bogan, and the billabongs all over the place. There would be a network of water. I also think that there is a very good place at Belalie Station (Mr. W. Scott's) that would throw the water back as far as Barrungun township, and all over the country for miles around. This would be of the greatest service to the district, as during this last drought there was very little water left, and, if rain had kept away for (say) three months longer, the stations all round and the Barrungun township also would have been deserted.

6875. That would be back water from the river? Yes.

The Macquarie.

6876. Do you know the Macquarie? I do.

6877. Do you know the Macquarie at the site where the water discharges from the defined banks into a swamp? Yes.

6878. Do you know the country between that site laterally to the Bogan—between the Macquarie and the Bogan? Yes.

6879. Do you know that a line crossing in that direction would bisect three or four creeks? Yes, dozens that have no name; in fact, there would be a perfect network.

Diversion.

6880. Do you think that upon survey a line of canal could be formed so as to divert the Macquarie into the Bogan in that direction? Yes, I am sure of it.

6881. And such a canal, with properly designed sluices, would discharge the waste waters of the Macquarie into the heads of those creeks again, if necessary? Yes.

6882. Then, if the waste water which is now carried over that large area of swamp were thrown into the Bogan, then, by the construction of dams in the Bogan to receive that water, a very large area of country would be supplied? Yes.

The Narran.

6883. Do you know of any other systems of creeks that might be treated in the same manner? I think the Narran basin might be treated in the same manner.

6884. Do you know the source of the Narran? I do not know exactly, though I have been all about the Narran.

6885. You do not know whether the head of the Narran in Queensland could be treated so as to conserve water for its supply? Yes, it is deep enough there, and has well-defined banks; up at Bangat it is a well-defined river.

6886. You are aware that the Narran sometimes discharges beyond the capacity of its natural channel? Yes.

6887. And do you think that if the water could be retained for a time at the head of the Narran in Queensland that that river might also be supplied? I think that all the west country, round about what they call the Narran Lake, might be supplied from the water that you would conserve above.

6888. Do you think that the water at the end of the Narran, before it discharges into the lake, could be intercepted and conveyed in another direction through the dry country between the Narran and the Bokhara? Yes, there is every facility for it.

6889. Do you know by indications that that is the drainage line towards the Bokhara River? Yes.

6890. Then, by diverting that waste water, a very large tract of country now dry could be supplied? Yes.

The Narran Lake.

6891. Have you any idea of the size of the Narran Lake when fully charged with water? I could not tell; it is miles round.

6892. But it is a shallow lake? Yes, it is like a vast plain.

Evaporation and soakage cracks.

6893. Evaporation and soakage take place quickly, and the water is quickly lost? Yes; there are immense cracks in the earth.

6894. But that volume of water, conveyed in a defined channel, would be comparatively permanent? Yes.

6895. Otherwise it is lost? Yes.

The Paroo.

6896. You know the Paroo River? I do, well.

6897. Do you know its source or its line above Hungerford? Yes; it runs some scores of miles above Hungerford.

6898. Do you think that the upper portion of that river in Queensland could be treated so as to conserve a portion of the water in a manner similar to the Narran? I think the Paroo could be much more easily treated.

6899. The water in the Paroo is largely availed of by means of dams throughout its length? Yes.

6900. But at its lower end it discharges into a large system of lakes and swamps? Yes.

6901. You do not know the area of that country which is now made useless by that network of swamps? I do not.

6902. Do you think it is worthy of inquiry whether that water which is now wasted in the swamps could be directed through another line of country and be made available towards the Darling? Yes, I think that is one of the grandest schemes out.

Narran Lake.

6903. You do not think it would be of any advantage to raise a levée or bank to increase the depth of the Narran Lake? I do not know whether it is possible or not; but I should think it is possible to raise the height very much, and it would still be a very shallow lake.

6904. Do you know the country between this and Cobar? I do.

6905. Have you formed any idea as to the drainage lines from the Darling and the Bogan towards Cobar? Yes; the drainage is from Cobar towards the Darling and the Bogan.

6906. *Mr. M'Mordie.*] Is there not a ridge between Cobar and the Bogan? Yes; there is a line of low hills.

TUESDAY,

TUESDAY, 26 *MAY*, 1885.

At Bourke.

Present:—

MR. BARTON, M.P., | MR. FRANKLIN, C.E.,
MR. M'MORDIE, M.I.C.E.

F. A. FRANKLIN, ESQ., C.E., IN THE CHAIR.

Mr. Christopher Brandis called in and examined:—

Mr. C. Brandis. 26 May, 1885.

6907. *Chairman.*] You have the management of a large station? Yes; Beemery Station.
6908. What is the extent of that station? About 400,000 acres.
6909. That is situated on the south-east bank of the Darling, at what distance above Bourke? The nearest boundary to Bourke is about 15 miles distant.
6910. By the river line? It is more, taking the windings of the river; it would be more than 25 miles that way.
6911. What has been your experience in the management of the country? In what respect?
6912. In regard to seasons, and the general difficulties which have arisen from bad seasons: how long have you been there? Eight years. The largest flood I saw was in 1880. Seasons.
6913. During your experience you have had excessively dry seasons? Yes, I had two, one in 1877-8 and the last season.
6914. Over what periods did the dry weather last? In the first case it was about eighteen months, and in the last you may say that the bad season lasted for something like two years—really bad.
6915. I believe you keep a correct register of the rainfall on your station? Yes, I do.
6916. Can you tell me what the rainfall has been during those periods? The average was a little over 14 inches. In 1877 it was 10·21 in.; in 1878, 16·63 in.; in 1879, 17·54 in.; in 1880, 18·15 in.; in 1881, 16·74 in.; in 1882, 20·10 in.; in 1883, 9·98 in.; in 1884, 7·97 in. Rainfall.
6917. Taking the mean of that rainfall, is it considered below what is necessary? Yes, very much below.
6918. What quantity of rain would you consider necessary for the cropping of this country—to keep this part of the country supplied with fodder? I think it would take 35 inches of rain to make fodder grow here; it also depends very much on how the rain falls. Crops.
6919. The natural rainfall is unreliable for the purposes of stock? It is.
6920. Will you tell me what means you adopt for the conservation of water on your run in the absence of rain? We have tanks. Tanks.
6921. How many tanks have you? Eight.
6922. What is their mean capacity in cubic yards? About 8,800 yards. There are some small tanks. Capacity.
6923. Then, with 71,000 cubic yards of excavation, you store what you consider a sufficient supply of water for your stock? No.
6924. Then, have you any auxiliary means for supplying the stock in case of extreme drought? I have given you the whole of the tanks on the run; but we have the Barwon and Bogan Rivers. Any tank under 12,000 yards is almost useless in this country.
6925. But I want to know if 71,000 cubic yards will not supply your run, what other means you adopt for the further storage of water? We put catchment dams on the Bogan—small, rough things. The Bogan runs through the run. Dams on Bogan.
6926. Will you tell me in what manner you construct those dams in the Bogan? We put small earth dams to catch the last of the floods. The Bogan only runs occasionally. The dams are of very temporary construction. Construction.
6927. Do you select a spot for erecting those temporary dams where the water does not flow in any volume? We select the shallowest part of the river. The river is a series of shallow holes; at one part the river is much deeper than at another; we put rough catchment dams in the shallowest parts. Site.
6928. What is the result of the construction of these temporary dams in the river? By erecting small dams, which are perhaps only 3 feet high, we get water for three or four months longer than we otherwise should; they back the water into the bed of the river. Result.
6929. To what distance? In some instances it goes back about 2 to 3 miles. Backwater.
6930. From that we may conclude that the fall of the river bed is 1 foot in a mile? Somewhere about that, I think, in many cases. Fall of river.
6931. In bringing your stock to water, you use the river as a more permanent means of supply than the tanks? Yes; of course, in the back parts of the run we have many paddocks with no river frontage, and there we have to use tanks. Watering stock.
6932. Do you think you take a larger proportion of water from the river by means of those temporary dams than is taken from the tanks in the back part of the station? Yes; that is, on the Bogan.
6933. Would you consider that you double the supply of water on your run by your dams in the river, taking a period of years? We could double the supply in those paddocks by properly-constructed dams. Supply.
6934. So that in the aggregate you have about 71,000 cubic yards of water as a standing stock every year? Yes, for those paddocks that are dry. There is only a small proportion of Beemery Run that has no river frontage, comparatively speaking.
6935. Do you find in the erection of these temporary dams that the water has a tendency to rise above the level that you bar off? Yes. Rise of water.
6936. How do you provide against that contingency? We make a small by-wash, picking an island in the bed of the river, and try to get a by-wash to let the water run round. By-wash.
6937. Have you found that sufficient at all times? It is not sufficient. I propose to put good overshot dams in the Bogan. Overshot dams
6938. There are many parts of the Bogan situated as you state, running on the frontage of runs, where overshot dams properly constructed would be of very great service to the runholders? They certainly would.
6939. And if they were placed in positions properly selected with regard to the fall of the slope of river, you would have almost permanent water throughout its length? Yes, you may say we should have permanent water without injury to any one.

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6940. At what height do you think those dams would be serviceable to the runholders without being detrimental to the ordinary flow of water in the river in times of flood? I think, in suitable places, 6 or 8 feet would be ample.

Height and length.

6941. With a rise of 6 or 8 feet, what would be the average length of the dam to touch the solid bank? I should think from 100 to 120 feet. I am speaking of places that one could pick in the Bogan—places that I am particularly well acquainted with in the lower part.

6942. Then that height would throw the water back in the ratio of the fall of the river, which you say is 1 foot in a mile, or 6 miles behind each dam. Yes, if suitable places were selected.

Low-level overshot dam.

6943. Do you know of any low-level overshot dams of a more permanent character in the Bogan? Yes, I know of one just above my boundary.

Construction.

6944. How is that constructed? It is constructed of piles and stones. The first design was defective, but by constant repairs by carting clay and stone they have made it a very good dam, and permanent.

6945. The silt brought down by successive floods tends to make it tighter? Yes.

Erosion of banks.

6946. Are there any signs of erosion of the banks at the wings of that dam? Not a great deal.

Flanking of dam.

6947. There is no positive tendency to flank the dam—that is, to change the direction of the current? No, there is not; the whole thing is constructed so queerly. I think the stone would have prevented the washing away of the bank.

6948. Then I understand that there is a rough sort of revetment at the flanks of the dam formed by stones pitched to the natural slope, and that this proves sufficient to prevent any flanking of the dam? Yes.

Height.

6949. What is the height of that dam? Originally I should think it would be 6 or 8 feet.

Flow.

6950. Do you think that properly designed and constructed dams built in suitable places would not interfere with the flow of the flood-water? No, not at all.

Floods.

6951. Or raise the height of the flood level? I do not think so. As a rule, when a flood comes down the Bogan it is a good high one, and comes down with great force, and after filling the dams would pass on down the river. I may state that in the dam I have just spoken of there was water throughout the whole of the last drought.

Bogginess.

6952. Do you find that in retaining the water behind these dams for a great length of time the margin becomes dangerously boggy for cattle? Not when the water is in the bed of the river. Some places are boggy, but it is not the rule.

6953. So that you find no objection to them in regard to stock in a weak state becoming bogged when seeking water? Of course sheep during a drought get into such a weak state that they cannot get out of even a few inches of mud, but sheep in fair condition can easily get out.

6954. You do not adopt any system of fencing off dangerous places? We do not on the Barwon—there are no places fenced off on the Bogan.

Supply in dams.

6955. During the dry seasons you have mentioned, have you always had sufficient water flowing into the Bogan to keep your dams properly filled? Our catchment dams have not been sufficient to keep a permanent supply of water.

6956. Have you always been able to keep your dams in the Bogan filled when you have had light rains? They have been filled, but with a heavy flood our catchment dams have been washed away.

6957. Supposing the system I have suggested of making a continuous step of dams all the way through the line of the Bogan were carried out, would the present supply of water fill a succession of dams? Certainly, from my experience of it; that is to say, I think that the dams we are speaking of would retain water for from nine to twelve months.

6958. Therefore it would be of great advantage along that line if a continual supply of water could be given? Yes, but I certainly object to full bank earth-dams.

Diversion from the Macquarie.

6959. You know the country between the Macquarie and the Bogan—the country that bisects Duck Creek and those other creeks that run that way? I have travelled over it many times, but I do not know it well.

6960. If it were possible to check the water that is now discharged over that country—the Macquarie swamps—and convey it into the Bogan on a cross line, and so regulate it at all seasons, that would be an advantage to a great extent of country? Certainly it would.

6961. And at times, I suppose, that discharge from the Macquarie would be more than the Bogan could bear? Yes, I think so.

6962. Unless portions of it were regulated down into the natural outlets that now exist, such as the Duck Creek, the Crooked Creek, and the Middle Creek? Yes, I think the Bogan could not take all the water. When the Bogan is in flood it spreads over miles of country itself, but I cannot tell you much about that line of country.

Supply of the Darling.

6963. Do you know whether the flow of water into the Darling from the Bogan and the Culgoa and other rivers is as much now as formerly? From my recollection it is as much now as it has ever been.

6964. You do not know that the dealing with these rivers by dams has at all influenced the discharge into the Darling? I do not think it has, except some large dams on the Upper Bogan; but some of the largest dams on Culgoa were put up before I came into the district.

Back-waters.

6965. During the flood that you have mentioned as the highest, to what extent did the flood-waters back on to your run? I should say about 10 miles from the river line.

6966. Was it shallowest close to the bank of the river—did the actual bank of the river stand out in hummocks and ridges? Yes; the whole country occupied by the flood was a series of islands, as it were.

6967. Would you say that you had 10 miles of still back-water over the whole length of your frontage? No.

6968. Over what proportion? It went out to a point. I should think it might average 2 or 3 miles wide.

6969. What would be about the depth of the back-water? It would be impossible to give the depth of it. In many places it would be from 15 to 20 feet in the depressions, and perhaps not more than half an inch running amongst the grass.

6970. What proportion of that flooded country would be about 15 feet deep? On Beemery Run there would be 40 or 50 miles of billabong averaging from 10 to 12 feet deep.

6971. If these deep basins of water were dammed in and secured, would they not keep permanent water for you at a higher level than the river bed? Certainly they would.

6972. And they simply require examination to fix the point at which they should be shut and regulated? Yes. I should state that most of these billabongs are near the river, that is, within a distance which the sheep could travel to the river Barwon for water.

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6973. Would you estimate the water in these billabongs to be of more value to you than the grass which would grow on the same area? Yes, in the deeper billabongs.

6974. In connection with the shutting off of these billabongs to impound water, would it be of any advantage to you for grazing purposes to build levées or embankments to shut out the shallow line of inundation? It would be of advantage to us, but it would be too costly. Levées.

6975. But suppose the country could be eased of its very heavy floods at the source above so as to reduce the maximum height, and prevent your being flooded by the increased volume in the narrower channel, would it be of advantage if the general drainage below was regulated by levées on the shallow parts of this country? It would be of advantage.

6976. So long as your impounded waters did not rise to higher levels by contracting the flood-waters into narrower channels? Yes; an immense amount of water could be taken from the Barwon and stored for any purpose in what is called the Dry Bogan. Storage in the Dry Bogan.

6977. Can you tell me the principal source of supply to the Dry Bogan? The Bogan itself; but only in times of extreme flood, and when the Barwon is high at the same time. The Barwon itself, when it rises to top of banks, will send water back up the Bogan for 20 miles. Source of supply.

6978. If the Dry Bogan could be impounded, could a drainage line be found in the direction of the county of Cowper, at the back of Oxley's table-land? No; the country round Oxley's table-land is higher than the Dry Bogan. Drainage line from the Bogan.

6979. Could it be taken so as to connect with the Mulga Creek? No.

6980. Or could it be led in a course somewhat parallel with Bourke, so as to run at the back of Bourke, and so into the Darling again? That might possibly be done, but I should not like to say. The greatest benefit of it would be in connection with the system of conservation of water on the river Barwon itself.

6981. What do you think is the length of the Dry Bogan from its inlet to the Bogan proper, or to that line which would be the back line of floods in the Barwon? Roughly speaking, 25 miles, following the Dry Bogan. Length of the Dry Bogan.

6982. What would be the mean average width of the river, then, between its upper banks as a basin? 200 feet, I should think. Width.

6983. And the slopes are generally natural—not forced up by the strength of the current? They are natural slopes. Slopes.

6984. That river from its formation, you think, has very little fall? Very little; but still I think it has more than the Bogan itself. Fall.

6985. Can you give me an idea what the fall would be in those 25 miles? Making a guess, I should say 26 feet perhaps.

6986. So that two dams in its length, say of 12 or 13 feet, would impound the water throughout the length of the Dry Bogan? Yes. Dams.

6987. That would make a permanent supply of water for that part of the country? Yes, but running parallel to the Barwon a few miles distant. Supply.

6988. Do you know of any rocky bars across the Barwon within the limits of your run? Yes; there are two—one is a bar; in the other case there is rather a deep channel between the rocks. Rocky bars.

6989. Have you ascertained by any means the run of the stone in the country on either side of the river? I have not.

6990. Do you know of any such bars above or below you in the vicinity of which a supply of stone might be obtained? No, except at Brewarrina. The Oxley table-land is about 20 miles away from those places I have mentioned. Supply of stone.

6991. Is there any loose stone in the neighbourhood of those natural bars? No.

6992. No attempt has ever been made to raise the water by means of stone weirs? No; that would impede the navigation of the river. I am speaking of the Barwon now. Stone weirs.

6993. You have never observed whether these bars exist along with the stone in the bank? It certainly does not appear above the surface of the ground on the banks.

6994. It does not crop out on the bank? No; it is not seen on the slope of the banks.

6995. Does it appear as if the floods have acted on that part of the bed of the river? Yes; it is water-worn. River bed.

6996. You have never selected the site of one of these bars for the erection of one of your temporary dams? We have not made any temporary dams on the Barwon; they are all on the Bogan. Temporary dams.

6997. Would it be possible to erect these temporary bars on the Barwon? As a matter of fact, the river was only dry in 1878. At West Bourke the Barwon was then dry for over a quarter of a mile, and there was just a narrow strip of water in the Barwon near the junction of the Culgoa—you could step across. Supply in Barwon.

6998. If it threatened to become almost dry, would you venture to put temporary dams in the main river? No, I have never seen any advantage to be derived from doing so.

6999. You mean you have never seen the possibility of its running as dry as the Bogan? I have never seen the possibility of its becoming dry through its whole length; it has always had plenty of water for stock.

7000. Do you water any part of your run by means of wells? No.

7001. Of course the storing and conservation of water for stock is a large expense in the management of a station? It is. Cost of water conservation.

7002. What proportion do you say it would be on a run of 100 square miles of dry country? I could hardly say. I should think that the expenditure on a 10-mile block would be £3,000 or £4,000.

7003. In view of that very large expenditure, do you not consider that it would be of great advantage to have a general system of well-regulated supply for the country? Speaking of the whole district and not of Beemery Run in particular, I should think it would.

7004. And if such a system of supply could be established, under what system of management would you consider that it ought to be placed—under the direction of local Boards, or of a Sheep Department in Sydney? I should say local Boards, certainly. Local Boards.

7005. Could you suggest in what way these Boards could be formed so as to ensure the most complete supervision of areas of country? At a moment's notice I could not suggest anything. I should say that the Board should be appointed by the leaseholders, but I could not suggest any system on the spur of the moment.

7006. Do you think it would be of advantage that a central Board should be formed consisting of members appointed from the local Boards? I think it would. Central Board.

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7007. Do you think the whole matter of water conservation is of such importance that legislation with regard to it is absolutely necessary? Speaking of this district, I certainly do.

7008. Have you anything to suggest that I have not already led up to by questions? No, I think there is nothing I could suggest.

Tarrion Creek.

7009. *Mr. Barton.*] You know Tarrion Creek, at the back of your run? Yes; it branches from the Barwon above Brewarrina, and goes through Charlton Run and part of Beemery Run to the Bogan, about 20 miles from the junction of the Bogan and the Barwon.

7010. Does not the Tarrion, in its lower part, die away as it were; does not the water run out into flats? Yes; you can see the creek, but there is very little in it.

7011. Would it be possible to improve that creek in any way so as to prevent the water from flooding the adjacent country, and so run more water into the Bogan in time of flood in the Barwon, at no very great expense? Certainly it would.

Dam.

7012. And is there any place on the Tarrion where, if a dam were constructed, it would conserve large quantities of water for a long time? Yes.

Size of tanks.

7013. From your experience, what size of tanks would you consider permanent for the number of stock that should, with good management, be depastured round it? Tanks of about 20,000 yards.

Form.

7014. And what is the best form in which to sink the tanks—I mean the best shape and the best batter? The greatest advantage is in having the tank as deep as the ground will possibly allow, with as steep a batter as you can have without the sheep destroying it.

Evaporation.

The evaporation is something tremendous.

Batter.

7015. Do you think it would be any improvement, and if so, would it be worth the outlay when sinking a tank for the supply of stock, to make it with a batter of (say) 1 to 1, putting the earth together on one side and forming in it a brick supply-tank with troughs, using a windmill to fill it, and never allowing the stock to go into the tanks? It would make the supply last much longer, and make a small tank answer the purpose of a larger one; but there is one thing against it—sheep do not do so well at troughs as at open water.

Supply in Barwon.

7016. With reference to the Barwon River, in your experience have you always found that there was sufficient water in the Barwon for stock purposes, and that it would be a needless expenditure of money to attempt to improve that river for stock only? There has always been sufficient water in the Barwon for stock, and any money spent on that river for stock would be simply thrown away.

Railway and navigation.

7017. It has been suggested that it would be of great benefit to the district and to the squatters on the banks of the Bogan if the Barwon were locked so as to make it navigable: I want to know whether, supposing that a railway could be constructed 100 miles up and down from Bourke, at £2,000 a mile, that would not be cheaper and better than locking the Darling in any way? Yes, I think it would.

7018. Do you know anything of Nellie Springs, or any of those springs at the back of Warraweena? I do not know much about them.

Straightening of Barwon.

7019. *Chairman.*] Can you tell us if, on the part of the Barwon River that you know well, there are any extreme points of the river where by a slight cutting a direct channel could be made? Yes, there are some.

7020. Do you think that a moderate-sized cutting there would enlarge during flood-time, and so straighten the course of the river? I think that a cutting made in the river would enlarge in flood-time.

7021. And the result would be a more direct flow of water, and the old bend of the river would then form a billabong? Yes, I think it would, and it would probably silt up at the mouth.

7022. Then, does it not occur to you that the present billabongs were formerly bends of the river? Some of them were undoubtedly.

7023. Their course and the timber on the banks would indicate that they were? Yes.

7024. Do you know a place where the bends of the river are so near each other that by a straight cut in the direction of the stream of about 60 chains you would avoid a deviation of about 7 miles? Yes; between Beemery and Bourke.

Width of Barwon.

7025. Then that might be used as a conserving basin? I should think so.

7026. What is the width on the top? 250 feet, I should think.

Depth.

7027. And the depth from the top of the bank to the bed of the river? About 30 or 40 feet.

Impounding basin.

7028. Then, in the natural course of silting up the old entrance to the river course, this would make an impounding basin of very large capacity indeed? Yes; but the river would not silt up to the full height of its banks.

7029. What I mean is, that by locking the two inlets of that large bend or billabong which would be then formed, an impounding basin of enormous capacity could be formed? Yes.

Evaporation.

7030. Have you adopted any means on your run to ascertain the evaporation in the tanks? No.

7031. You take general observations for the Astronomer, I believe, on your run? Yes.

7032. Would you also undertake to observe the evaporation, if proper instruments were supplied to you? Yes, I should be most happy to do so.

Diversion from the Macquarie.

7033. *Mr. M'Mordie.*] You have given some evidence as to the practicability of intercepting the water of the Macquarie above the Marshes, and of turning them into the Bogan? I said I was not sufficiently well acquainted with that country to give an opinion.

7034. If those waters were so intercepted would it be practicable to provide a permanent water frontage along the Mara Creek? I am not sufficiently well acquainted with that part of the country, and would rather not give an opinion about it.

Mr. Mark Tully called in and examined:—

Mr. M. Tully. 26 May, 1885.

7035. *Chairman.*] You have resided a long time in this district? No; only four years.

7036. Are you a runholder in the district? Yes.

7037. Where is your run situated? Directly opposite the Beemery Run. It is Warraweena. The western boundary of the run goes below Bourke. The West Bourke township has been cut out of a corner of the run.

7038. Do you know all the country between the Culgoa and the Warrego? I have never been outside my own boundaries.

Billabong.

7039. On which river do you depend for your supply for stock purposes? The Barwon and the Culgoa.

7040. Have you any creeks running from the Culgoa which are not clearly shown on the map? There is a large billabong, which runs from the junction of the Culgoa, and enters the Barwon again 15 miles lower down; it is called the Warreena Billabong.

7041.

Mr. M. Tully. 26 May, 1885.

7041. Is that billabong generally dry when the river is low? Yes, except in one or two places—it empties as the river falls.
7042. Would the water obtained in that billabong be of any advantage to you? So much so, that I have erected a dam across with a view of retaining it.
Dam.
7043. Is the dam erected across the inlet? No; about 5 or 6 miles below the inlet.
Height, capacity.
7044. What is the height of the dam? It is about 20 feet. There have been over 10,000 yards of stuff taken out of it.
Overflow.
7045. How do you admit the water into the billabong? From the overflow of the Culgoa and the Barwon.
Current.
7046. Is there any current there likely to disturb your dam? No; the current is very little, on account of the bed of the billabong being so much higher than the bed of the river.
Depressions.
7047. How do you convey water round the dam? By natural depressions in the surrounding country.
7048. The dam is higher than those depressions? Yes.
Lagoons.
7049. What is the nature of the lower end of the billabong? Very flat; there are three or four deep lagoons. There is like a chain of lagoons, with wide shallow flats between them.
Impounding.
7050. What work do you propose to do to impound the water to the level of your dam throughout the length of the billabong? I should think that an overshot dam at the outlet would be the most likely means of impounding it.
7051. I understand that an upper dam has been built? Yes.
Flood.
7052. Have you yet seen the result of a flood from the river? Not since the erection of the dam.
Levels.
7053. Have you done any levelling there to ascertain how the contour level would correspond with your dam? No; I have examined it carefully with a view of damming the water into the billabong from the Culgoa, but I have not taken any levels.
Outlets.
7054. You feel sure, having erected that dam, that there are no outlets at a lower level? Of course, the by-wash is at a lower level than the place where I erected the dam.
7055. But I mean at the lower end of the billabong, are there any depressions lower than your dam? Yes.
7056. So that you could not impound the water to a greater height than the lowest place at present? The water at the lower end of the billabong would run into the river again. The only way to impound it would be by erecting a dam to prevent the water from running into the river as the river falls.
Overshot dam.
7057. What do you consider should be the nature of the dam to be constructed there? I should think an overshot dam would be the only one.
7058. Have you fixed on any design? No; I have never erected any overshot dams.
7059. So that you have not completed your intentions yet in regard to that matter? No.
Tanks.
7060. What do you do for a general supply for stock purposes besides getting a supply from the river? I have sunk tanks in the back country.
Area of run.
7061. What is the area of your run? 440,000 acres.
7062. You are still making tanks? No; I have completed all the tanks that I have the means of going on with at present.
Tanks.
7063. What would be the amount of storage necessary for your purposes on 100 square miles of back country? Two tanks of 20,000 yards each.
Expense.
7064. At what expense could they be constructed? At 1s. 2d. per yard.
7065. Considering that large expenditure, a permanent supply provided under a proper system of water conservation and distribution would have a value relative to the expenditure of the run-holders? Yes; certainly.
Water-rate.
7066. And in that case you would consider it fair if a water-rate were levied that would return the interest on the money expended throughout the country on a general system? Yes.
Local Board.
7067. And if such a system could be established after due inquiry, what system of management would you consider best for its upkeep, and for the general distribution of the water so conserved, and for the collection of the water-rates; should it be in the hands of local Boards, or a Department in Sydney? I should say in the hands of local Boards, under the administration of the Government.
Wells.
7068. Have you any wells on your runs? Yes, I have two.
7069. Did you sink them yourself? I sank one myself.
Size.
7070. What are the internal dimensions of that well? 6 feet by 2½, divided into two shafts.
Depth.
7071. To what depth is that well sunk? About 250 feet. The other is about 150 feet.
7072. Are the two wells in close proximity to each other? No, they are 8 miles apart, on the back country.
Quality.
7073. What water do you get from them? The water in the 250-feet well is very salt, totally unfit for stock; the other has a limited supply of very good water.
7074. No effort has been made to go to a greater depth? I should be inclined to think we should strike salt water if we went deeper.
Site. Boring.
7075. If you desire to strike other wells, have you any means of fixing upon a site where fresh water could be obtained? I have a Tiffin boring-machine, and I put a bore down 493 feet. I struck water at 22 feet from the surface, with a supply of about 3,000 gallons a day; it is good enough for stock, but unfit for domestic purposes.
7076. And have you discontinued that work? Yes; I had to discontinue it when the drought commenced, and I have not recommenced it. I intended to go on with it, but now I do not know whether I shall.
Creeks.
7077. What are the principal creeks on your run? The Culgoa and the Barwon.
7078. Then you have no creeks? No.
Warreena Creek.
7079. What do you call the billabong we have been speaking about? The Warreena Billabong or Creek.
Banks.
7080. What is the nature of the soil on the banks—is it fit for cultivation? With irrigation it would grow produce, but not so as to pay for irrigation.
Fodder.
7081. If you had large stores of water on the river frontage in the billabong would you be induced to cultivate fodder for storage purposes? No, I would not.
Mexican grass.
7082. Are you aware that there is a kind of grass growing luxuriantly on the banks of the Darling which is said to produce to the extent of 120 tons to the acre, and is suitable for cattle and horses? Yes; I saw the plant you speak of at Mr. Gibson's.
7083. If that could be produced to the extent of 120 tons per acre, would it not well repay the expense of irrigation? Yes, unquestionably.
7084. And would it not give you an immense store of fodder to tide over an extremely bad season? Yes, if it could be preserved.

Mr. M. Tully. 26 May, 1885.

7085. Can you give us any particular information gained during your experience here in the way of suggestions? No, I have no suggestions to offer.

Floods. 7086. Is much of your run submerged by shallow water? Not much of it. There are places where the water comes out 4 or 5 miles during extreme floods; nine miles is the furthest it comes, but that is only in one place, and in a narrow strip.

Lignum flat. 7087. Do you know approximately the width of country where that water runs? It is 2 or 3 miles in extent; it is a wide lignum flat.

Levée. 7088. Supposing you were to make an embankment or levée to prevent the water from re-entering the river, what would be the depth? Not more than 15 feet.

7089. The deepest parts would be little billabongs? Yes; they only occur here and there.

7090. Taking the mean of the greatest depths and shallows, what would you consider to be the height of a bank necessary to keep the water in the river course? An average of 9 or 10 feet.

Borings. 7091. Have you kept a section of your borings? I have, but I have not got it here.

7092. Would you furnish a description of it as an appendix to your evidence? Yes. *(Appendix Y.)*

7093. You have been a resident on the Murrumbidgee? Yes, for fifteen years.

7094. On what part? On the higher part, in the Narrandera, Hay, and Jerilderie districts.

7095. Do you know a large billabong that runs from about Tubbo Run? Yes.

Gum Creek. 7096. In which direction does it run? Into the Gum Creek. From there it flows into what they call the Box Creek, and it gets into the Yanko somewhere about Conargo.

Dam. 7097. Do you know whether any effort has been made to retain the water in that creek? Only by damming the creek on the station by means of earthen dams. Mr. M'Caughy has made a dam on the Box Creek.

7098. And these dams, I suppose, are sufficient to store water for a time? Yes; they are only temporary. The creek is shallow in most places.

Storage. 7099. Do you think that overshot dams of a more permanent character would answer the same purpose, and supply water for all time? I think that no overshot dams that could be erected would make it permanent —the creek wants deepening.

Improvements on creeks. 7100. Do you think the creeks generally in that district could be improved after careful examination, by straightening and deepening, and levelling of bars? Yes, I think so.

7101. But that, generally, permanent water cannot be retained except by a system of damming? No.

7102. Do you know if along that creek there are any natural depressions of considerable depth that might be found for storing excess flood-water? I do not know the creek sufficiently well to give a decided answer.

Natural depressions. 7103. *Mr. Barton.*] Do you know of any natural depressions, or dry lakes, or anything of that kind on this run where water could be led by canals or anything of that sort so as to store large quantities of water? I do not know of any where the bottoms are so porous that they would not hold water.

7104. Do you know of any large billabongs except the Warraweena? No.

Springs. 7105. Do you know anything of the Nellie Spring? No; I have been to Thully's mud springs.

7106. How far are they back from the river? About 18 miles from the Culgoa.

7107. And from the Barwon? The nearest point would be over 20 miles.

7108. Do you know of any other springs? Not from personal knowledge. I know from hearsay that there are other springs.

Supply. 7109. Is there any supply of water at this spring? Only a limited supply. Wells have been sunk in the neighbourhood of the spring, within 100 yards from which good fresh water has been got at a depth of from 40 to 70 feet. They had three wells there which, during the drought, watered about 200 head of stock—cattle and horses.

7110. Do you think that the water that supplies these wells is the same that rises in the spring? No, it is different altogether.

Mr. D. W. F. Hatten called in and examined:—

Mr. D. W. F. Hatten. 26 May, 1885.

7111. *Chairman.*] You are the owner of Yanda Station? Yes.

7112. How many years have you been a resident in this district? Eleven years, but I have been twenty-nine years on the Darling.

Yanda Station. 7113. You are well acquainted with the features of the surrounding country for a considerable distance beyond your station? Yes.

7114. I suppose that your general supply of water at the station is some portion of the river frontage? Yes.

Supply. 7115. And on the back blocks water is obtained by means of tanks and wells? Yes; we have one well.

7116. How far, and in what direction, is your station from Bourke? It is 20 miles from Bourke, on the southern side of the river.

7117. How far does it run back? 37½ miles.

7118. Your back country southward then would be in the direction of Cobar? Yes.

7119. Does the country rise towards the back of your station and towards Cobar? Yes; the fall is towards the river from Cobar.

Yanda Creek. 7120. Are there any well-defined creeks or watercourses from the direction of Cobar flowing towards the Darling through your run? Yes; there is Yanda Creek.

Source. 7121. What is the source of that creek? It rises near Cobar, east of it.

7122. What distance would Cobar be from the river? About 80 miles, I think, in a straight line.

Length. 7123. That would be about the length of the creek? Yes.

Width. 7124. At a distance of 20 miles back from the river what is the sectional area of the creek? It varies a good deal; I should think about from 50 to 100 yards in width; that would give a mean width of 75 yards.

Depth. 7125. And what would be the depth? In some places 20 feet, in others 30; I should think an average of 20 feet.

Watershed. 7126. Is the watershed of the creek very wide? Not very wide.

Supply. 7127. The supply depends mainly on the rainfall? Yes; the average waters from the river only back up 5 miles.

Dams. 7128. What is the state of the creek now, after this long dry weather? All the water runs out; the only water in it is held by dams.

7129. You have formed a dam in the creek? Yes.

Site. 7130. Where is it situated? About 20 miles from the river.

7131. What is the nature of the dam? There is a reef of rock crossing the creek at the side of the dam, but we found the drift sand running 19 feet in one of the banks, and we had to go 19 feet to get a solid clay bottom; we found this sand in various layers, and the drift of water-worn gravel extends down for 19 feet. Mr. D. W. F. Hatten. 26 May, 1885.

7132. Did you trench out that depth of 19 feet? Yes.

7133. What did you do? We dug out a trench 18 feet wide and filled that in with surface clay—good sound clay—and worked it with horses and drays, which were constantly carting over it. Trench.

7134. To what height above the creek level did you carry that core of clay? 6 feet. Core of clay.

7135. And you found sufficient cohesiveness in the clay, with the assistance of water, by simply compressing it with the horses and carts? Yes.

7136. You then connected that clay core with the ridge of rocks? Yes; it is a kind of slate formation. Slate formation.

7137. Then you formed your dam over that clay core and ridge of slaty rock? Yes.

7138. To what height did you carry your dam? In the highest part about 24 feet. Height of dam.

7139. What was the width of the dam on top? About 12 feet. Width.

7140. What was the batter of the inner slope? From 3 to 1. Batter.

7141. What was the batter of the slope down stream? About the same; we made it the same on both sides.

7142. What was the result of that? The first flood we have had since was three years after; it came down in January last, the water came down with great force and flooded over the by-wash. There was a low bank at one side, a little above the dam, which acted as a by-wash, and the water followed over there to a width of nearly 100 yards, and fell some little distance from the dam into the creek again, so that the dam was not flanked by the pressure; the dam has held 3 miles of water. Result.

7143. With a 20 feet rise? Yes; that water is standing now.

7144. Have you fixed a gauge so as to know what the evaporation and other loss is? No; the water has gone down 5 feet I should think since it was full. Evaporation.

7145. That is a foot per month? Yes; but during the last six weeks it has gone down scarcely anything.

7146. Then you believe that the great loss at the higher level is due to the permeable nature of the surface soil? Yes; there are great drifts of gravel. Soakage.

7147. After impounding these 3 miles of water behind your dam, what proportion of the water from that rainfall would pass the dam and enter the river? Millions of tons; it was running for sixteen days, and for five days the water did not recede very much; there was a stream of from 50 to 100 yards in width for five days, after which it began to recede. There was an average depth of 2 or 3 feet, and a width of 100 yards. Water entering the river.

7148. What was the extent of the local rainfall which produced that discharge? The rainfall we had was only some 4½ inches, but the fall at the source of the creek was 8 or 9 inches. Rainfall.

7149. For what time? About twenty-four hours, I think.

7150. Do you think that the waste water flowing through the creek was equal to eight times the quantity required to fill a succession of overshot dams throughout the length of the creek? Yes. Waste water.

7151. Then I understand that this creek can only be charged by an occasional excessive rainfall? Yes; there have been several other dams in the creek, but they were carried away by this flood. Rainfall.

7152. What would be the maximum amount of rainfall in twenty-four hours that would ensure a run through the creek from its source to its outlet? That question is very difficult to answer.

7153. Can you suggest any means by which we could get a permanent supply of water in the creek? By making dams every 10 miles. Permanent supply.

7154. But if we make these dams, you say that the rainfall is not reliable? No, it is not; but there are frequent thunder-storms which would flood 10 miles of the creek. I have seen that often, but I have never seen the water run through before.

7155. But if such thunder-storms were localized at the head of the creek, they would only fill high dams such as yours at the head of the creek at the expense of those lower down? Yes; a thunder-storm would benefit the dam which it fell on, but it would not injure any one below.

7156. You are quite satisfied that it is not practicable to carry the Darling water to Cobar? I am quite satisfied of it. Diversion from the Darling.

7157. Do you know anything of the Mulga Creek? Yes. Mulga Creek.

7158. Is it similar to the Yanda? Yes, but not so well defined.

7159. But as a matter of fact it runs through the same country? Yes.

7160. Do you know how the country lies west of Cobar? No; it is undulating—that is all I know.

7161. Have you found the country about your run pretty good for the construction of tanks? Yes; we have sunk thirty-two, and I suppose we have taken out something like 340,000 yards of earth. Tanks. Capacity.

7162. What is the extent of your run in square miles? It is 278,000 acres. Area of run.

7163. What would be the cost of making permanent water for stock on 100 square miles of back country? I should think it would require £4,000 at the lowest calculation to make it permanent; 10,000-yard tanks are of very little use for permanent supply. Cost of water supply.

7164. Then, in consideration of that great expenditure on water for stock, do you not think it would be a great advantage to the whole country if the conservation of flood-waters were carried out under a proper system? Yes, I do. Flood-water conservation.

7165. And if distributed for stock and agricultural purposes it would be an advantage to the whole country? Yes, it would.

7166. And there would be no objection to pay a fair rate equal to the interest on the money expended for the benefits derived from it? No, I do not think that any squatter would object to it. Water-rate.

7167. And how do you think such works ought to be supervised—by local Boards or by a Department in Sydney? I think by local Boards. Local Boards.

7168. Such Boards to have the supervision and maintenance of these works for distribution? Yes, as in the stock districts and sheep districts.

7169. You have a well sunk on the back part of your run? Yes, about 35 miles from the river. Well.

7170. What are the dimensions of the well? 6 × 4 feet. Size.

7171. To what depth was that well sunk? 110 feet. It is in a very low basin, which has the appearance of being an old creek. Depth.

7172. It is an ordinary slab well? Yes.

7173. At what depth did you reach water? We reached fresh water at 37 feet, but there was no supply; the water was found in a very coarse kind of gravel and water-worn pebbles. We put in drives for 20 feet Depth to water.

Mr. D. W. F. Hatton. 26 May, 1885.

on two sides through this gravel and on to the rock, but the supply never increased—the water only rose to 7 feet.

7174. Did you determine in which way the water was flowing when you put in the drives? No; it seemed to be just water percolating through the strata.

7175. And then you proceeded to a greater depth? Yes; at 97 feet we struck very salt water in a kind of rotten rock with iron veins running through it, in some places very hard, in others very soft; there were little cavities in the rock. We then went down 13 feet further, but the water increased so rapidly that we could not keep it baled out with a horse drawing, and we had to give up the work. The water rose to the level of the fresh water—to a height of about 80 feet—and it stands at that; there is 80 feet of water in the well.

7176. You failed to lower the water by any system of baling you could adopt? Yes.

7177. Would a supply of water in that position be of any value to you? Yes.

Condensing water.

7178. It never occurred to you to condense the water? No.

7179. Do you think, considering the value of the water, that you would be justified in attempting to condense it for stock purposes? Yes; only that we do not want it, having so much surface water stored.

Depressions.

7180. Do you know whether, in the vicinity of these creeks, there are any natural depressions which could be connected with the flood levels in the creeks, and be taken advantage of in times of excessive floods? No, I do not think there are.

Legislation.

7181. Can you suggest any means of legislation which would bring about a system of water storage throughout the country which would be beneficial in times of extreme drought? Only by making dams. I think that the Government should take in hand the making of these dams and charge the lessees for the water.

7182. Can you suggest any sort of line by which a calculation could be made as to the quantity of water which might be estimated as required for every block of 10 miles square? No, I could not.

Suggestions.

7183. Can you offer any suggestions which would be useful to us about matters upon which we have not questioned you—do you know of any features of the country which might be dealt with in order to extend the direction of the present line of creeks or direct their courses? No; the Yanda Creek is particularly straight.

Diversion from the Bogan.

7184. *Mr. Barton.*] Do you think from your knowledge of Yanda and Mulga Creeks that it would be possible to turn the Bogan River down them in times of flood, and to fill the dams erected in them so as to make them useful and beneficial to the country? I do not; the country is too high to the south.

7185. Too high between the Bogan and the heads of these creeks? Yes.

Tanks.

7186. Do you think that any better system of tanks could be devised than those now in use, into which stock are allowed to go? I think that it would be better to raise the water into troughs by means of windmills or some means of that kind.

7187. And then less water would supply the same number of stock? Yes, because the stock carry away as much water in their wool as they drink.

Size.

7188. What size of tank would you consider sufficient to hold permanent water to supply the stock that ought to be grazed around it in a fair average season? 10,000 yards if the water was raised, and 20,000 yards if it was not.

Bends.

7189. Do you know of any bends along the Darling where small cuttings across would shorten the river materially, and leave a large holding which might be dammed up to conserve water? Yes, there are bends of 5 or 6 miles in length.

7190. What is the largest one you know of? It is just below Yanda; it is less than half a mile across between the ends of the bend, and it is 4 miles around.

7191. Half a mile of cutting there would save 4 miles in distance, and give you 4 miles for water conservation? Yes.

7192. Do you think, from your knowledge of the ground, that if a small channel were cut there it would wash its way through? I am sure of it.

7193. *Chairman.*] If these 4 miles of river were reserved as a billabong, what would be the sectional area of the river? I should think 500 feet across, and 40 feet deep.

Mr. M. R. Dwyer called in and examined:—

Mr. M. R. Dwyer. 26 May, 1885.

7194. *Chairman.*] You are a pastoral tenant in this part of the country? Yes.

7195. Where is your run situated? It adjoins Mr. Barton's, on Mulga Creek, on the southern side of the Darling.

7196. You have had considerable experience during the period of your residence here? Yes, for about four years; I came here in 1880.

7197. Then your experience has been during the present dry period? Yes, in this part.

Loss of stock.

7198. You had considerable losses of stock during that time? Yes, we lost 9,000 sheep out of 15,000.

7199. What is the extent of your run? 63,500 acres.

7200. And what was the number of your stock? Something like 15,000.

Sheep per acre.

7201. How many acres do you consider should be given to a sheep in this country, safely, under the ordinary conditions of the seasons? During the last drought it would take 20 acres to the sheep. I do not know if that would be sufficient.

7202. You have proved that by their falling off to about that ratio? Yes. If the rain had not come when it did we should have lost them all. Among the 15,000 there were 8,000 young sheep. We first put on 4,000 ewes, and the next year we put on 3,500, and between the two lots they bred up to nearly 15,000.

7203. *Mr. M'Mordie.*] Is not that one sheep to 4 acres? Yes.

7204. Finally the sheep were reduced to one sheep to 8 acres? Yes.

7205. *Chairman.*] Then you found the carrying capacity of your country, at the end of the drought, equal to one sheep to 8 acres? That is about it.

7206. You did not hesitate to put on your run one sheep to 4 acres? No.

7207. But owing to the want of water and grass your stock were reduced by one-half, or one sheep to 8 acres? Yes.

Feed.

7208. And at the end of the time you had no natural feed on your run? No—no grass; the sheep lived on scrub—emu-bush and white bush.

Mr. M. R. Dwyer.
26 May, 1885.

7209. Since then you have had rain, and now have grass? Yes, plenty of grass now.
7210. And you think you have tided over the difficulty with what you have saved? Yes.
7211. What provision have you made for watering the stock? In all I have about 63,000 yards of excavation for storage, but the tanks did not fill; some of them were sunk for three years. Tanks.
7212. At what cost did you make these tanks? We paid 1s. per yard. Cost.
7213. And you think that amount of excavation was absolutely necessary for the number of sheep you had? If the tanks had all been full the country might have carried the sheep, but some of the tanks had been sunk three years before there was sufficient rainfall to fill them.
7214. What did you do during that long interval for watering the stock? I had three tanks full, but two of them were on the side of the road, and the public made use of them and emptied them. Watering stock.
7215. Were those tanks sunk at your expense? Yes. At the time they were sunk there was not such a large amount of traffic as there was afterwards. A tank of 10,000 yards could not supply 3,000 sheep and the quantity of stock that was travelling. Supply from tank.
7216. Had there been a supply of water at the back of your run at that time, from which you could have drawn the water for your stock by gravitation, you would not have hesitated to use the water? No.
7217. And if such a supply had been available at that time, it would have been worth the value of the 9,000 sheep you lost? I do not know that they would all have lived if they had had water, because there was not feed enough—there was not sufficient scrub within reach of the sheep to keep them alive. Cutting scrub is a very great expense; it is better to let the sheep die and buy others. Want of feed.
7218. To prevent a recurrence of such hard times, can you suggest anything that could be done in the way of improving the creeks in the neighbourhood of your run so that they will keep up a supply of water? No; the creeks do not hold. Supply in creeks.
7219. Do you know the Mulga Creek? Yes. The Mulga.
7220. It rises in the watershed towards Cobar, I think? Yes, somewhere near Langtrees, between Cobar and the Bogan.
7221. It has a very large catchment area? Yes, but very little falls into it; in some places the creek nearly runs out level; it loses itself on the flat, and then forms again lower down, and so on throughout its length.
7222. Would it be of general advantage to that part of the country if the creek could be straightened and those shallow parts embanked, so as to retain the water in an artificial channel? I do not think so, for this reason: where this creek passes round you get clay-pans; then you may cross another place where there is a kind of limestone rock like cement, which will take water as fast as a sponge. For instance, I have sunk a tank on my run on the east side of the railway line, and that tank has been filled three times, but it never held—the 2,000 yards would run out in three days. There are several other places like it. Formation.
7223. Do you not know also that there are places not like it intervening between the spots where the soakage takes place? Yes, there are places.
7224. Do you think it would be possible to divert the stream so as to avoid these soakage places? I do not. Diversion.
7225. What would prevent it? There are sandy places that you could not pass, and there is not fall enough on the creek. It is of no use to attempt making dams on that creek; I have one of the largest dams on it, and it is giving way now—the water runs away faster than it could run through a 4-inch pipe. Fall. Dams.
7226. Have you had any experience of wells? I have sunk one, but that was on the other side of the Lachlan. Well.
7227. Not out on the Mulga Creek? No.
7228. You cannot suggest any means which will improve your permanent supply by the storage of storm-waters? No, except by tanks. Storage.
7229. Are there any features of the country which would direct you in constructing a tank so as to enable you to select good retaining country? It is very easy to tell the country that will retain water. There is a great deal of the country upon which you cannot get a place in which to sink a tank. Tanks.
7230. Do you know anything of an inordinate rainfall of 7 or 8 inches at the head of the Yanda and Mulga Creeks? That rainfall did not occur at the head of the Mulga, but from beyond Byerock, nearly as far as my place, and then it went down along the line. If it had kept on another twenty minutes or half an hour it would have gone over the line just past my boundary. Rainfall.
7231. What was the state of the Mulga Creek—was there plenty of water in it then? There was water in the tanks, but none in the dams. Mulga Creek.
7232. What was the state of the Mulga Creek at the time of the heavy rain—was it flowing freely? Yes; it ran eight days past my place, and the dam I had stopped it all. That is the water which is now soaking away. It was at times, I suppose, 20 yards wide, and up to a horse's belly.
7233. *Mr. Barton.*] What do you consider the best kind of tanks for watering stock in this country, both as to size and design? I think about a 10,000-yard tank. Size of tanks.
7234. And do you think it is better to let the stock water in the tank, or to pump it into troughs by means of a windmill or something of that sort? While there is plenty of water in the tank sheep can water at it without doing any harm, but when it gets low it becomes bad, and it is much better in troughs. Stock watering.
7235. Having experienced the late drought, do you think it would be a great benefit to the people if we had cheap lines of railway running through this district, to enable them to get their stock shifted to other pastures? Yes; there would be some chance then of keeping the stock alive. Cheap railways.
7236. If there had been railways available during the last drought, would they have been the means of saving some millions of sheep? I believe they would. Then again, the Sheep Act is very hard against the saving of sheep. Sheep Act.
7237. Do you think the present Act regulating the travelling of sheep requires altering, so as to enable squatters in this part of the country to send their sheep to better pastures in order to save their lives? I think some discretion should be left to the Board so that they might distinguish between bogus sales of sheep and sheep that are being legitimately travelled owing to the want of feed. When a man has not overstocked his country, and wants to travel his sheep to obtain grass or water in times of drought, he should have some consideration.
7238. Then it should be left in the discretion of the local Boards to say whether a man should be allowed to travel his stock by droving; but you do not see any reason why they should have the power to determine where a man should send his stock by rail? No, I do not think they should.
7239. Have you ever felt any inconvenience in this part of the country from stock being allowed to travel by various routes and tracks all leading to the same place? Yes, and so have many others besides me. Stock travelling.

Mr. M. R. Dwyer. 26 May, 1885.

7240. Do you think it a great hardship to squatters that the Government have not defined routes which only they should permit stock to travel? Yes, I do. I think it is a great hardship that people driving stock should be allowed to drive them by either any one of several parallel routes instead of being confined to one principal route.

Mr. Finlay Macrae called in and examined:—

Mr. F. Macrae. 26 May, 1885.

7241. *Chairman.*] Are you a runholder in this district? I am managing for Langloh Parker.

7242. Where is the run situated? On the Hungerford Road, north-west of Bourke.

7243. At what distance from Bourke? About 90 miles.

7244. On what river is the run situated? On no river at all; it runs on part of the Cuttaburra Creek.

Cuttaburra Creek.

7245. The Cuttaburra Creek rises over the border in Queensland, does it not? Yes, I think it runs out of the Warrego in Queensland, and it runs into the Paroo.

7246. Do you know the nature of the country across the border in Queensland? No.

7247. Does the Cuttaburra run through your holding? It runs on to one block of it; it opens out into a large plain on the country we have rented.

7248. How far from Ford's Bridge is the place you are speaking of now? 38 or 40 miles.

7249. Is it called Yantabulla? Yes.

7250. And the Cuttaburra on your station is a well defined creek? No, not on the country we have—it runs out into a large plain; it is a well defined creek from Mogagaroo.

7251. Is not Yantabulla 23 or 24 miles from the border? It is more than that—it must be 40 miles.

7252. Then the last-named place you referred to is to the north of that, and near to the Queensland border? It is to the north-east.

Water supply.

7253. Have you a pretty permanent supply of water in the creek? Yes.

7254. During all the late dry weather? Yes; right through the last drought there was a good supply at Brewarra, but at Mogagaroo it went dry.

7255. Do you know if anything has been done on the Cuttaburra to conserve water? Nothing whatever that I know of. There are no dams now; there may have been some which have washed away.

7256. Have you seen the water running through that creek in large volumes? No, I have not. During the last rain it was not high—not a banker.

7257. Where did the waste water run to? It ran down the plain, and I suppose into Nocoleche Run.

7258. You do not know what fall there is in the bed of the creek, do you? No; I simply know it from riding along.

Distribution.

7259. Then you cannot give us any idea whether it would be worth the trouble to inquire if the water could be carried in an artificial channel through the county of Irrara—whether it could be extended over the flat country by means of a canal? There is sufficient water, I should think, to carry it down; it is a series of clay-pans.

Lake.

7260. Is your main supply for the use of the run obtained on that one creek? No; we have a lake, where most of our sheep are watering now. That lake is situated 25 miles to the south of the creek.

Supply.

7261. Is the lake supplied by drainage from the Cuttaburra Creek? No; from the Kerribee and Coonbillie Creeks.

Sources.

7262. What are the sources of supply of these two creeks? The Kerribee Creek is a tributary of the Irrara, but a great deal of water runs down that creek from local rains.

7263. Do you know if in the centre of the county of Irrara there is a dividing ridge which throws the water into the Warrego and Paroo? I do not.

The Irrara

7264. You know the Irrara Creek, do you not? Yes.

7265. Is it better supplied with water than the Cuttaburra? No, but it is a better creek.

Dams.

7266. Are there many dams on the Irrara Creek? Yes, several; there are three that I know of.

7267. Can you particularize them in their positions? Yes.

7268. Where is the upper one? It is on Robinson's Run, about 25 miles from the Queensland border.

7269. What is the height of that dam? I do not know. It is an earthen dam; it will hold 8 feet of water.

7270. Have you any means of remembering how far that dam backed up the water with an 8-feet rise? I do not know. It all depends on the by-washes. They have secured very much, and when the creek is running they are obliged to be closed.

7271. So that it would not be possible for the water to pass that one dam without destroying the dam itself and the by-washes? No.

7272. So that that dam 25 miles from the border of Queensland would intercept the whole of the water? No; the water runs round.

7273. And in running round it runs over a great amount of flat country? No; it runs into warrambools.

7274. At what distance below that dam is the next dam? 12 miles. It is of similar construction, with natural by-washes.

7275. Where is the one below that again? That is on Goyder's run.

7276. Do you know the particulars of it? No.

7277. You told us that the Cuttaburra Creek was the only one on your run? Yes.

7278. What other means have you of watering stock? We have springs and a well.

Reed springs.

7279. What are the springs? Reed springs they call them.

Peat.

7280. And are those springs depressions on the general surface of the ground? Yes, they are all in a hollow, and the water rises above the surface. The water oozes up through peat, and when it comes through some of the peat comes up, and it runs away down the side then into a gully.

7281. And do you use that gully in the neighbourhood of the spring to water the stock? We have the spring fenced in, with a drain round the fence, and the stock walk round and put their heads in to drink.

Stock.

7282. How is that country stocked? With sheep, horses, and cattle.

7283. How many head of stock can you water? About 4,000 head of sheep.

Supply.

7284. Constantly? Yes; the spring makes very much more water in cold dull weather.

7285. Excepting that, do you know if there is any other cause of a fluctuating supply? I do not.

Wells.

7286. Is there a constant supply? Yes; of course the stock will drink the water down, but it makes again during the night. We have wells sunk through the peat where water is obtained.

Mr. F. Macrae. 26 May, 1885.

7287. How do you sink the wells—with slabbing? Yes. They are only shafts. We get clear water in the wells. I have seen artesian wells put down in exactly the same kind of springs, on Tago and Taree Runs, between the Culgoa and the Warrego.

7288. Who is the owner of that run? Robb & Co.

Artesian wells.

7289. You have seen these artesian wells? Yes; 3-inch pipes were put down—I do not know to what depth, but about 100 yards from the springs—and the result was that the water rose up through the pipes, and troughs conveyed it from the pipes to a tank, into which the water was constantly running. When the tank was full they turned a tap which was on each side of the pipes. They had two pipes down.

7290. How high did the pipes stand above the surface of the ground? 4 feet you might say.

7291. And you have seen the water running? Yes.

7292. Does it run with any force? No force at all—it just trickles out. When the tap is first turned the water runs quickly for a short time.

7293. Do you know whether the pipes have been left to run continuously for any length of time? Yes.

Supply.

7294. What is the longest time they have been allowed to run? They have run until the tanks were full, and I should think there were 5,000 yards in the tank. The tank was filled from the springs, but I do not know whether the water was left running continuously.

7295. Then you do not know really whether the water was running continuously, or whether the spring seemed to be exhausted for a time until the water made again? No, I do not.

7296. Do you know if any extended research has been made to establish the line of that artesian supply? No, I do not. I only know the springs by seeing them, and hearing Mr. Wilson, who put the pipes down, speaking about them.

7297. They appear to have gone just as far as their own requirements demanded? Yes, they watered about 15,000 sheep right through the drought, I am told.

7298. Do you know of any other place where artesian water is to be found? I have not seen any, but I have heard of one at Widgegoara—Mr. Bignell's run.

Size of well.

7299. You speak of a well which has been sunk out in your country—what is the size of that well? It is a 6 feet by 4 feet well.

Depth.

7300. And at what depth in the rock did you find the water? About 13 feet; the water came through the rock.

7301. What is the depth of water on that well? 8 feet; the well is about 27 feet deep.

Strata.

7302. What is the stratum in which the water is found? It is rock; the water comes through the crevices of the rock.

7303. What kind of rock is it—sandstone? No, it is harder than sandstone.

Supply.

7304. And can you maintain a depth of 8 feet in the well? No; you can empty it in half-a-day's drawing, but it will make again in a few hours.

7305. How long will it take to exhaust the well? Five hours, with two large buckets and a windlass—one up and one down the whole time, with three men working at it.

Quality.

7306. What is the nature of the water—is it pure, fresh water? No, not quite fresh, but it is drinkable; the stock are very fond of it.

7307. Do you know of other wells that have been sunk in that district? Wells have been sunk at Yantabulla, but they do not get any supply there; they hardly had water for their own use last December.

Situation.

7308. And how is this well you have been speaking of situated with regard to your station? It is 10 miles to the south of Yantabulla.

7309. It is on the roadside, is it not? Yes, within three-quarters of a mile of the main road to Hungerford.

Other well.

7310. You have no tanks? No. There is another small well which has been put down some years; it is about 1 mile from the well we have now; it has been put down right in a spring on the sand and the water runs over the top, but there is no great supply in it. The well is about 14 feet deep.

Source.

7311. The source of this artesian water has never been discovered? No; it is simply the water rising to its own level.

Depressions.

7312. Do you know if in the county of Irrara, at the outlet of the Cuttaburra Creek, there are any natural depressions which could be used for storage purposes? There are plenty of places where you could make tanks to be filled from the waters of the Cuttaburra.

7313. But as a matter of fact you have not found it necessary to do it? No.

7314. And these creeks, the Irrara and the Cuttaburra, are quite sufficient to supply you with water? There is not sufficient water to supply all the stock that country could carry, but we have not many stock there.

7315. Do you know that at the lower part of the creek, where it joins the Warrego, there is an ana-branch? No; I have not been further than Tinenboro, Mr. Tyson's station.

Mr. Alfred Elliott Randell called in and examined:—

Mr. A. E. Randell. 26 May, 1885.

7316. *Chairman.*] You have been navigating the Darling for a number of years I believe? Yes.

7317. And for the purposes of navigation you are perfectly acquainted with the features of the river, especially the river bed? Yes, decidedly—that is a portion of our business.

7318. And you are also acquainted with the inlets and tributaries and the positions of billabongs of importance? Yes; more so below Wilcannia than at this end of the river.

7319. How many trips have you made between Wilcannia and Bourke? Through trips, only four.

Navigation chart.

7320. This is your navigation chart of the river (*chart produced*) showing all the difficulties and dangers of the river, the positions of rock, and, approximately, the inlets of creeks and outlets of the billabongs? Yes, approximately.

7321. At this time, I believe, your steamer is lying up at Bourke? Yes, owing to insufficiency of water; the river is below what they call the summer level.

Gauge.

7322. Do you know the present gauge that we have in the river? Yes.

7323. At what level does the river stand now on that gauge, above zero? About 5 feet; it is covered with mud.

Navigation level.

7324. How far is the river below navigation level? 4 feet 9 inches.

7325. Then 9 feet 9 inches above zero is your navigation level at Bourke? Yes.

7326. Then a rise of 4 feet 9 inches at the present time would release you from your present position? Yes.

Mr. A. E. Randell. 26 May, 1885.

7327. Do you know if where those rocks are met with in large quantities the stone extends inland? I could not say; they appear to be reefs or ridges of stone running through the country.

7328. But you do not see the stone cropping out of the high banks? No; it is in the bed of the river.

7329. What is the scale of the chart produced? About 4 inches to the mile.

Bends. 7330. There are places on the river where very sharp bends give you large sinuous turnings? Yes.

Cutting. 7331. And by making a straight cut some distance would be saved? Yes, there are places where a mile might be cut off the river by making a straight cut from the bends.

7332. The result of that would be that the flood-waters would cut the channel straight? Yes.

Result. 7333. And what would be the result in the billabong or bend? It would partially silt up to about half the height of the ordinary level of the banks.

Silt. 7334. What would be the nature of the silt? Clay; it would be the mud which is held in suspension in the flood-water.

7335. And when that settles in these disused bends does it make them perfectly watertight. Yes; it is that which forms our lagoons.

Island. 7336. At 13 or 14 miles down the river I see there is an island? Yes.

Creek. 7337. And a creek just up above that island: do you know the name of it? No; we have no names for them—we just put them on the chart, and that is sufficient for us.

Bends. 7338. In a case where two sharp bends of the river are a mile apart, 5 miles of the river might be saved sometimes by making a direct cut? Yes; in many cases you might do that by means of canals.

7339. That would improve the navigation? Yes, but it would let the river away faster.

Lagoon. 7340. And all the disused part of the river would have a tendency to fill up? It would fill up at either end and remain a long lagoon.

Width. 7341. What is the width from bank to bank on top? 80 or 100 yards.

Depth. 7342. By what depth? About 80 feet on an average.

Reservoir. 7343. Supposing that disused part were locked off as a reservoir, it would contain a very large quantity of water in flood-time? Yes.

Bends. 7344. Do you know many places of that kind, where you have to make a great deal of mileage for a short distance? There are many such places.

Cuts. 7345. Here is another place, where you run about 2½ miles, and where a cutting of three-quarters of a mile would make a straight course? Yes; there are many sharp bends where you could save a mile.

7346. In this particular case you would shorten the river, improve the navigation, and save about 3 miles, besides avoiding a very dangerous, rocky part of the river? Yes.

Warrego. 7347. Do you know of any other large inlets so far as I have gone? No; the first large inlet is the Warrego; it comes into the river just above Louth; it is the only large one.

7348. Is the course laid down on this chart the course at ordinary navigation level? Yes; when the river is at the 9 feet 9 inches level we have to take that course.

Dangers. 7349. So that there is scarcely a stretch of 5 miles without dangers in the shape of rocks? No.

Current. 7350. I suppose that when the river is at the lowest navigable level there is very little perceptible current? Except in the narrow places, where it rushes through very strongly.

7351. Then you find that in all cases where the water space is confined there is a pretty good current even at this time of the year? Yes, except when the river is very low indeed. The Darling goes very low—almost dry.

Navigation. 7352. Suppose that the flood-waters were regulated at the head, so as not to allow the excess of flood to come down, would there be any danger in shortening the course of the river? It would affect the navigation; I do not think there would be enough water for navigation all the year round.

Fall. 7353. Do you know what the fall is from Bourke to Wilcannia? I do not; I know that it is about 200 or 230 feet from here to Wentworth.

Traffic. 7354. Do you think that if the navigation could be maintained between Wilcannia and Bourke it would be the means of conveying produce, such as wool, from that place to Bourke? Were it possible to maintain regular communication between Wilcannia and here the trade would all go from here to Wilcannia, and Wilcannia would derive all its supplies from Sydney *via* this place.

Locks. 7355. Have you heard any suggestion as to any means besides locks by which the navigation could be kept open? It is the universal opinion on the river that that is the only means. I have not heard of any other except the scheme of fixed bars in the river; and that we do not consider feasible, because the unloading of cargo would more than neutralize any benefit to be derived from it.

Traffic. 7356. Suppose that the means of communication were kept open, what do you think would be the quantity of wool brought? I can only give a very remote approximation; I should think it would be at least 20,000 bales. They would start from Culpaulin, I should think, and cart the wool; because that is only 18 miles from Wilcannia, and the object of the squatters is to find a regular and quick means of getting their wool away.

7357. What are the means adopted at present below Bourke for the conveyance of wool? Only steamers. We anticipate getting wool from stations outside a radius of 40 miles.

7358. But that entirely depends on the navigable state of the river? If the river is not navigable the wool must remain; they cannot cart wool more than 40 miles without great difficulty.

7359. When did you arrive here on your last trip? On the 27th March.

7360. And you are now imprisoned here? Completely.

7361. *Mr. Barton.*] What is the longest time you have known a steamer to be imprisoned on the Darling? Fifteen months.

Rises in river. 7362. *Chairman.*] And do you depend on the periodical rains? Yes. We anticipate a rise in the river in September; if it does not come then we will expect it in the following March.

7363. So you do not attach much importance to being detained for six months on a trip? We do, but we have to put up with it.

Depressions. 7364. Did it never occur to you from your observation that there were depressions in the banks of the river sufficiently large that, if flood-waters were impounded in them, the river might be kept navigable for a considerable time afterwards, by regulating the water down? Not between here and Wilcannia. There are large lakes at Menindie which would have that effect, but none at this end.

7365. If above Bourke and up to the sources of the river there existed such places as you describe at Wilcannia, capable of storing large quantities of water, do you think that the river could be kept navigable

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Mr. A. E. Randell. 26 May, 1885.

in the way I suggest? I think not; I thing that the supply is not sufficient to keep the river navigable the whole of the year by storage. I judge from the amount of water which now passes down the river.

7366. But with the addition of the water which might be stored in these large bends of the river? No, I do not think so. Of course I have not the means of judging, but my opinion is that sufficient water does not fall or could be retained to render the river navigable in dry seasons, because it dwindles down so fearfully.

7367. Have you considered the great depth of the upper part of the river, and the navigable surface of it? I have; it is a matter we have often discussed on the river amongst ourselves.

Sectional area.

7368. Have you ever considered the proportion of the sectional area of the navigable stream to the extreme sectional area of the flood level? I have.

7369. What is the proportion? I do not say that I have considered the exact area, but we have considered it in relation to whether we could hold it; I should think that 1-20th of the water would be sufficient.

Navigation.

7370. And if 1-20th of the flood discharge could be maintained by any means, you could make the river navigable from Wilcannia to Bourke? Yes, but that would only be a wave passing down; if the stream could be maintained at that level, it would require 1-20th of the area of the full discharge of the river.

7371. That would be desirable if it could be done? Yes, decidedly, it would be very advantageous, but not so much to the boats, because regularity of communication means low freights; but it would be very nice for the residents.

Storage.

7372. *Mr. M'Mordie.*] Making a very large allowance for possible storage, what length of time do you think that storage would supply water to the river up to navigation level? I do not think that you would have been able to fill any very large storage during the last twelve months—not nearly sufficient to keep the river navigable up to the present time—there has not been sufficient rain.

7373. But suppose you had storage equal to the capacity of the river, and turned it into the river in sufficient quantity to keep up the navigation level, how long do you think that the supply would last? It might last about a week perhaps—not more; it would be a small rush down the river.

Weirs.

7374. *Chairman.*] Have you noticed, in passing up the river, whether there are any advantageous sites for the erection of weirs across the river? Oh yes—two or three places on reefs which at present exist.

Stone.

7375. Are there large quantities of stone to be obtained at these reefs? No, you could not obtain stone except by cutting through the reef, and you would have to remove about 30 feet of earth.

7376. You do not know of any place where a bar exists in the river with a stony ridge near? No; we have very little knowledge of the country back from the river.

Positions.

7377. Can you particularize what you consider the best position for one of these weirs, whether of masonry or any other material? I could particularize several places where there is a reef; the Kennedy reef is one.

7378. Where is that situated? About 50 miles by water above Wilcannia, and 30 miles by land.

7379. Is that below Louth? Yes, it would be about 80 miles below Louth; Mount Murchison Station is the nearest.

7380. If it is near to Mount Murchison Station, then it is not near Wilcannia? It is 50 or 60 miles by water above Wilcannia.

Stone.

7381. What is the nature of the stone? It is very dark, hard stone.

Bar.

7382. Is it a broad bar? Yes, it slopes down; at present there would be a fall of about 3 feet over it.

7383. Then in ordinary navigation levels you can cross that bar? Yes, but it is a great obstacle between Wilcannia and Louth, because there is no channel.

7384. It raises the water about 3 feet above the ordinary level at the present time? Yes.

Erosion.

7385. Do you notice any effects of scouring or erosion of the banks on the side of the river? No, because the reef slopes towards the centre.

7386. And do you think that if that reef were levéed—if the course were carried higher—that that would prevent erosion? Yes; I have seen instances of falls in that way, and I have never noticed any erosion of the banks.

Silt.

7387. Have you ever noticed whether there was much silting on the up-stream side of the bar? No; it deepens away again.

Back-water.

7388. How far back in the river does that bar affect the water? I do not know; the water gets very bad for miles back; I should think it affects it for 10 or 12 miles.

7389. So that by increasing the height you could go still further back? Yes.

7390. And it is only a question with regard to navigation whether any sort of lock could be inserted in that reef? Yes.

7391. You do not know the nature of the rock? I do not; all I know is that it is very hard, and of a granular nature.

River course.

7392. Have you noticed very great changes in the course of the river? In two or three places only.

7393. Can you give any reason for those changes? Yes; the water breaking through narrow necks.

7394. Just as we have been considering? Yes; it breaks through naturally and then silts up.

7395. And the old bends are left as billabongs? Yes.

Soil.

7396. Are you acquainted with the soil in those places? It is all hard clay.

7397. The surface soil is not clay, is it? Yes; I am thinking particularly of a place near Wentworth. In 1877 the river was in its natural bed, but since then it has silted up and made a new course, leaving the old bed as a billabong.

Old course.

7398. Could this old course be shut off at a moderate outlay? Yes; the great difficulty would be to put a strong enough weir at the lower end of the old channel; it is the upper end that always silts first.

Locks.

7399. Can you suggest any practicable means for making the river navigable up to Bourke? What I consider the most practicable plan is to lock the river at the islands in it, because there are natural weirs there already.

Steamer.

7400. Yours is a stern-wheel steamer called the "Corowa"? Yes.

Width.

7401. What is the width of it over-all? About 28 feet; the barges are about 20 feet.

Length.

7402. What is the length of the steamer outside of the wheel, clear of everything? About 120 feet.

7403. Is the barge about the same? The longest barge on the river is about 118 feet.

7404. Then steamer and barge together would make 238 feet over-all? Yes.

Draught.

7405. What is the light draught? About 3 feet.

7406. What is the full cargo draught? It varies; about 4 feet 9 inches to 5 feet with a full load.

Mr. A. E. Randell. 26 May, 1885.

7407. Then in the construction of locks you have considered that both steamer and barge should be locked at the same time? Yes—to save waste of water. For instance, here is a bend of the river about a mile in extent; it is navigable at the lowest level at present, it having a narrow entrance; I would place a lockgate at the upper end, and another at the lower.

Lock-gates.

7408. Do you mean to say that you would place the gates so far apart as to leave only a length of 240 feet between them? If it were artificial entirely I think that it would be sufficient, but by taking advantage of the natural places you could make them half a mile long without any greater expenditure.

Water saving.

7409. But the longer the distance you make between the two gaps, the greater would be the waste of water? Of course; but 238 feet would be quite sufficient; you would want a reservoir to save the water.

7410. Then there would not be any saving of water by taking the steamer and the barge through at the same time? No.

7411. The information you have given to us has been with reference to that portion of the river between Wilcannia and Bourke? Yes.

Talywalkas.

7412. Do you know the position of the entrance to the Talywalka? Yes, to one Talywalka; there are several creeks about Wilcannia called Talywalka.

7413. Did you ever form an approximate idea of the area of the outlet and the depth to which they descend towards the bed of the river? They are the full depth of the river, and on an average are sometimes 1-5th of the width, but they vary of course.

7414. Can you give us any idea of the width of the Talywalkas as they run off? I dare say they are a quarter of the area of the river.

Width. Depth.

7415. What is the width in feet across the top? The average width is about 50 feet at the top, and the depth from 35 to 40 feet.

7416. They are fully charged in times of high floods? Yes, they are all filled up from the river.

7417. And as the river falls, what becomes of the water? It falls into the river again.

7418. Did it ever occur to you that it would be possible to lock the water in these Talywalkas? I have often thought that it could be done, but they narrow very fast as a rule; the greatest depth is at the mouth.

7419. You are aware that although they narrow very rapidly in from the mouth, they convey a very large volume of water into the land beyond? Yes, decidedly.

7420. Do you know many outlets like that to the south-west of the river? There are a number of outlets from the river on the north-west side.

Chart.

7421. Will you give a copy of your chart to the Commission, if it can be traced in Bourke during the time of your detention? Yes, with pleasure; it is a chart made from actual observation, by Messrs. Ebenezer and William Randell.

Mr. G. C. Tompson, Chairman of the Land Board, Bourke District, called in and examined:—

Mr. G. C. Tompson. 26 May, 1885.

7422. *Chairman.*] You have had a long experience of the western portion of this Colony, and you are prepared with notes of your experience? Yes.

7423. Will you kindly read those notes?

I have been a continuous resident in this north-western portion of the Colony upwards of ten years; when I came to the district, in the year 1875, all the back runs were, in the southern portion of the Warrego District, with the exception of Wittagoona, where there were a few cattle and sheep, unstocked, and the only residences in that part of the district were at Wittagoona, 46 miles south-east from the Darling River and on the road from Bourke to Cobar; at Currawcena public-house, 43 miles south from Bourke; at Tindayrey, Campbell's public-house and Mr. Woodhouse's camp, 67 miles from Bourke; the town of Cobar, which had at that time a population under 300, and at Mr. Thomas Lean's selections at Bulgo Spring, 40 miles south from Cobar; on the road from Bourke to Cobar, the Cobar Copper Company, to enable their teams to get to Bourke, which at that time was their only depôt, excavated five small supply tanks, viz.—at Two-waterholes, 15 miles from Bourke; Corrilla, 27 miles; Curraweena, 43 miles; Tindayrey, 67 miles; Mopone, 92 miles. These were very shallow, and consequently ran dry nearly every summer. At Cobar the excavated tanks were very limited, and used frequently in the summer months to run dry. On the road from Cobar to Louth water could be obtained at Wittagoona, which was a natural basin at the foot of a waterfall at head of Wittagoona Creek, and at Keirangundah, where there was a natural waterhole which held water for about three months after rain; this waterhole is on Keirangundah Creek, same creek which runs from Wittagoona and finds its way into the Darling River, on Winbar Run. Mr. Thomas Lean, at his selections at Bulgo, had several shallow wells sunk in the flats between two ranges running into Sandy Creek, and on the banks of Sandy Creek, where he obtained a fair supply from soakage water sufficient for about 3,000 sheep. At Tindayrey Campbell discovered fire-clay, which he sold to the Cobar Copper Company for brickmaking purposes, and thereby by taking out the clay enabled him to make a very deep excavation, which he afterwards converted into a tank for conserving storm-water, and was the means of securing to that part of the district a permanent supply of water for travellers, but not stock. At Bye, which is about 50 miles south-east from Bourke, a shaft was sunk for prospecting for gold; this shaft when I saw it, in May, 1875, had water at a depth of about 20 feet from the surface, but the water was unfit for use in consequence of a large number of dead animals being in it, and the only place water could be procured was at Byerock, 2 miles north from above-mentioned shaft, in a hole in the rock, and this was the only place water could be obtained between Tindayrey and Gongolgon, a distance of about 80 miles. Water could also nearly always be obtained in small spring at south end of Gundabroha Mountains. During the winter of every year from 1875 to 1880 I explored this back country, and have examined every hill and every run in this district. The soil in the back country consists of red chocolate colour, and prior to being stocked was of a very porous nature, and when riding over it the horses would sink in over their fetlocks, except along the Brumby (Wild-horse) tracks, which I always found very useful in discovering shallow pools of water in Yarran Flats for camping purposes; the water was of a reddish brown colour, but could always be made perfectly clear by the use of alum or gypsum. The wild horses and cattle used this back country after rain, and when the gilgais dried up they were compelled to return to the frontages again. The back country is chiefly undulating, and the wild horses and cattle proved very useful, as they formed pads which acted as drains to the gilgais, which soon filled after rain. This country in wet weather was so rotten that if the wild horses went off the tracks they bogged at once, and I have seen them run for miles in Indian file and could not get off the pad (beaten track). In consequence of the porous nature of the soil it was thought impossible to get catches for making tanks, and consequently these blocks at that time were thought so little of that in the year 1874, when £20 per annum rent was put on them, the lessees forfeited them, as they did not consider they were worth that rent. In 1874 two good back blocks changed hands for £45; in 1875 they brought £75. In the winter of 1876, this back country was looking beautifully green with grass and herbage, and the inner districts were suffering from drought; sheep travelling for grass were brought out into this back country, and the persons in charge were granted permission by the late Mr. D. J. O'Neil, who held a large number of these runs, to remain on the country without paying any rent; there was sufficient water in the gilgais by excavating a small tank and drawing the water from the surface into them to last the men from two to three months, and the sheep, with the green herbage, lived during that time without water. All being shepherded proved a great benefit, as the country where the sheep were yarded, after the first rain became quite hard, and acted as a watershed. These sheep were taken back within four months fat, which at once brought the Cobar country into note, and then persons were eager to buy, and blocks changed hands at £300, £500, £800, £1,000, and up to £5,000, and one naked block

Residences. Tanks. Waterholes. Wells. Fireclay. Shaft at Bye. Soil. Value of runs.

block I knew in 1880 to bring £10,000; this block was no better than the two that changed hands in 1875 for £75. The new purchasers in 1876 commenced excavating tanks and fencing-in paddocks, but they experienced great difficulty, the winter seasons of 1877 and 1878 being very dry, and the water in the small gilgais did not last long for men and horses, and many persons had to cart water distances of 20 miles for the men excavating supply tanks, and those that had excavated large tanks had to wait twelve and fifteen months before they got a drop of water in them. 1879 was a magnificent season, and all the tanks in that district were filled with water; the tanks in the first instance only being about 12 feet deep, soon dried up in the summer months; a depth of 18 feet was then adopted, which, except in extraordinary dry seasons were permanent. These blocks were so much improved by the conservation of water that one of the blocks which was forfeited in 1874 because £20 per annum rent was put on it, seven years later changed hands, stocked and improved, at £32,000 cash. This country which, ten years ago, was looked upon as a barren waste on account of having no permanent water upon it, is now by artificial means rendered capable of permanently carrying over a million sheep. Mr. G. C. Tompson. 26 May, 1885.

In this back country there are two long and well defined creeks: first, Mulga Creek, which heads in the county of Flinders, passes through Canbellego and Cowper, and runs into the Darling on Junction Run; the other is Yanda Creek, which heads in the county of Mouramba from the Nyngen Ranges, and runs through the counties of Robinson, Yanda, and Cowper into the Darling River on Yanda Run. Mulga and Yanda Creeks.

The Sandy Creek, which heads in the county of Mouramba, runs into the Darling River; several good places in the creek where water can be obtained by sinking; on Bye Run, county of Cowper, a deep well was sunk, where I understand good stock water was obtained, also good water was obtained in a well at the north-west corner of Glenariff Block H Run; a well was put down on Yanda Creek on Mogenlamba South No. 1 Run over 100 feet—no water obtained; a well was put down at back of Back Dunlop Range at Mulga, where salt water was obtained; in a well known as Taylor's Well on the southern side of Mount Derma good brackish water was obtained, which is used by stock; on Winbar Run another well was put down, known as Cooney Well, where a very fair supply of water was obtained. Sandy Creek. Wells.

There is a small spring on Rankin's Hill No. 3 block B, which in 1877 kept seven horses and three men, but latterly, I am informed, it is not so good.

There is a good creek known as Gidgegelambo, which heads on Rankin's Hill No. 3 block D Run, at Gidgegelambo. There was a magnificent water-hole which I, many years ago, reserved. This creek, I am informed, runs into the Darling River. Gidgegelambo Creek.

A deep well was sunk on the boundary dividing Glenariff block G and H Runs, where salt water was obtained, and afterwards stock water was struck. Well.

These blocks in former years were frequently forfeited when they only had £10 rent on them.

In the northern portion of the Warrego District, on the Irrara Creek, there was one very large earthen dam at Wapwella, which was the means of conserving a large body of water in that creek, which, without artificial means, was a dry watercourse in summer-time. Dam.

In the Warrego River, which has a very narrow and shallow channel, eleven earthen dams were erected between the Queensland boundary and the Darling River, which were the means of conserving large quantities of water, and had it not been for those dams the whole of the Warrego would have been dry. This river is so narrow in places that when it runs it is not more than 2 yards across, and the banks in places being only about 1 foot high, the flood-waters soon leave the channel and inundate the low frontages. Dams in the Warrego.

The Warrego in Queensland, when there is a high flood, overflows its banks, and sends the water across North Darling Back Runs Nos. 10 and 15, which are situate between the north and Culgoa, and I have seen quite creeks running through those runs, and there was a cart bogged which must have been left there many years ago by some drover, showing that they were forced out by the floods. South of those blocks was Colless Spring, which yields a very fair supply of water. East of No. 15 were Gerara Spring, Shearer's Spring, 2 miles north of former, which was an exceedingly good one, and yielded enough water for 7,000 sheep. On North Darling Back Run No. 18 there are three good springs; at Tully's Spring it is a mud one. There is also a very good spring at Leila Woolshed, on East Warrego No. 16 Run. Warrego floods. Springs.

The Culgoa River has some good holes in it which are the means of giving a fair supply of water. The river, when I knew it, had no dams whatever on it, except one in an ana-branch on block B Run, which conserved a fair supply of water. The residents used to put tail dams on the channel just as it was about stopping to run, and thereby gave themselves a fair supply of water. The Culgoa.

The next river, the Bree, was a very small and shallow channel. On this one large dam was made on Milroy, which threw the water back many miles. The end of this dam on the left bank was always being washed away, and it was a heavy expense in keeping it in repair. Higher up this stream tail dams were made when it had nearly stopped running. The Bree.

The Bokhara River, which comes from the Bree River, is not so good, as the water in the Bree has to rise to a certain height to run through Bokhara, and I have on several occasions seen the Bree running and no water in the Bokhara except where it was conserved by means of dams. In the Bokhara there were more dams than on any of the rivers. On the Upper Bokhara, above its junction with the Bree, on Currawillonghi Station, in this Colony, there were two overshot dams which proved a great success, being quite sufficient for conserving a large body of water without wasting any by throwing it over the banks. On the Bokhara, below the Bree junction, there were more permanent earthen dams than on any other river except the Warrego, having no less than nine dams on it, and three overshots. The earthen dams proved a great source of annoyance to the neighbours below each of them, more especially one, as it blocked the water and then diverted out of the channel and irrigated a large area of country before any water found its way back into the channel. In the Narran there were some very good water-holes, and gate dams were used for many years, until the late Mr. Newcomen put an overshot on the river below Angledool, which proved a success for a time until it was partly washed away, and on the Lower Narran there were two earthen dams. This river filled what is known as Narran Lake, and when full is like the sea, as it is treeless and one cannot see across it. The Bokhara. Overshot dams. Narran Lake.

There are wells with good supplies of water on the following runs between the Barwon and Narran Rivers:—Burrawondool; Boorara; Pinegobla; Bukulla; Muggaric Back B; Llanillo; Gorrway; Dungalear Back No. 3; Plumbola Blocks; Combuddery Back. Wells.

There is a large warrambool which crosses the Queensland boundary midway between the Moonie and Narran Rivers, and runs parallel with those rivers some distance and into the Barwon at top boundary of Boorooma.

Another warrambool comes out of the Barwon at top boundary of Dungalear Run, then runs parallel to and distant from the Barwon about 4 miles, and turns into that river at top boundary of Utah Run. I have seen both these warrambools running in flood-times, and experienced very great difficulty in getting through them on horseback, the one nearest the river being a swim. Warrambools.

In the Mara Creek, which runs between the Bogan and Macquarie, there are a great number of earthen and overshot dams which conserve a large body of water. Mara Creek.

WEDNESDAY, 27 MAY, 1885.

At Bourke.

Present:—

Mr. BARTON, M.P.,	Mr. LYNE, M.P.,
Mr. FRANKLIN, C.E.,	Mr. MURRAY, M.P.,
Mr. GIPPS, C.E.,	Mr. M'MORDIE, M.I.C.E.,

Mr. TARGETT, M.P.

W. J. LYNE, Esq., M.P., President, in the Chair.

Mr. G. C. Tompson recalled and further examined:—

7424. *President.*] To which part of the country does the paper you have read refer? To the southern portion of the Warrego district—south of the Darling. Mr. G. C. Tompson. 27 May, 1885.

7425. Have you ever considered the question of diverting a portion of the Macquarie and Bogan waters through the country between Cobar and the Lachlan? Never.

Mr. G. C. Tompson. 27 May, 1885.

7426. Do you know the country from Cobar towards the Lachlan by Nymagee? I know the country from the Bogan across through the Nymagee country, and from there right away out as far as Mount Hope.

7427. What is the nature of the country? After leaving Bourke the soil, until you are approaching Nymagee, is of a chocolate colour, after which you come upon a mixed sandy soil of a lighter description.

Country. 7428. Is it level or undulating? It is undulating country. There are a few isolated mountains, and near Nymagee there is a range of hills.

Range. 7429. About what height? I should think about 200 or 300 feet high.

7430. Is that country generally known as dry country? Yes, but there is a great deal of artificial water.

7431. Is there any permanent artificial water? There is plenty of permanent artificial water.

Tanks. 7432. What do you call permanent artificial water? Water in tanks from 18 to 20 feet deep.

7433. How long would a tank 20 feet deep last without being replenished, supposing that no stock were watered at it? I should not like to answer that question.

7434. Have you no idea? No idea at all. I believe that such a tank would not become dry for two years, provided no stock went to it.

Supply. 7435. How many stock would a 10,000-yard tank, 20 feet deep, water? About 5,000 sheep.

7436. And how long would it last? A whole twelvemonth.

Diversions from the Bogan. 7437. Do you think the country we are referring to, between Cobar and the Lachlan, is of such a nature that it would be possible to divert water from the Bogan through it by means of a canal? In my opinion you could not divert water through there, because the Cobar country rises. Supposing you started from the Macquarie somewhere about Wellington, in order to get the water on to the Cobar country the canal would have to be a tremendous height coming across by the Bogan, otherwise you would flood all the country down the Lower Bogan and the Macquarie.

7438. But do you not know that between the Bogan and the Lachlan there is high country all through? I know nothing about the country lying between the Bogan and the Lachlan, in the counties of Kennedy, Cunningham, Gordon, and Ashburnham.

7439. But suppose that the country in those counties is high, would it then be possible to divert the water from the Upper Bogan and Macquarie? I do not think it would be possible to take the water across into that country.

Canal. 7440. But supposing the country is high enough between the Bogan and the Lachlan to carry a canal into the Nymagee country, would you then think it practicable? I will say this,—that if the water could be conveyed by means of pipes to a high point——

7441. Or an open canal? You could not take it in an open canal, because the country is too high.

7442. But if the country on the other side is high enough, do you think it possible to carry a canal through it? No; because the country in the counties of Kennedy and Cunningham is hilly country, and you would have to go a tremendous way through those hills to get a canal at all.

Creeks. 7443. Are there any falls? There are creeks running through the country.

7444. Is that the only reason why you think the water could not be diverted? Yes.

Soakage. 7445. Do you think it possible to carry water a long distance through dry country? No, because in summer-time it would all soak into the ground as it went along.

7446. But supposing that the water was always available, and when once it was sent it was not allowed to run dry? Then you might be able to do it.

Tanks. 7447. What means would you propose to water the country lying between the Darling and the Lachlan? The only means is by excavating tanks.

7448. Are there no other means? None at all.

7449. Then you do not think that any improvement could be made on the present means of watering the country? No.

Diversion from the Darling. 7450. Not by diverting a portion of the Darling? No; because the back country is so much higher than the Darling.

7451. Are you aware that the Darling and the Lachlan water came within 30 miles of each other in the flood of 1870, opposite the Willandra Billabong? It might have done so there. I know nothing of the country down by the Willandra Billabong.

7452. How far down do you know the Darling? To Wilcannia.

7453. And do you think the water from the Darling might be taken out towards the Willandra Billabong from or near Wilcannia? I should not like to answer that question, because I do not know much about the country between Wilcannia and the Willandra.

7454. But supposing that the country is not too high, do you think it possible to divert a portion of the Darling water towards the Lachlan? From what I know of the country I do not believe it is.

7455. Why, if the country is not too high? From what I know of the country I do not believe it is possible. I may mention that out on the left bank of the Darling coming round, I have heard that water has been got out from the south-east of the river a distance of between 20 and 30 miles.

7456. Supposing that the country is not too high, is there any other reason why the Darling water could not be taken through that country? But the country is too high.

7457. But if the flood-water of 1870 came out near to the Willandra, that proves that the country is not too high? If it did so.

7458. But we have evidence that it did? I do not know anything about that country at all.

7459. But is there no other reason you know of except the elevation that would prevent the water from being taken? If it were all flat country between the Darling and the Lachlan the water might then be diverted.

7460. But there is no other obstacle except the elevation of the country? If the country between the Darling and the Willandra were all flat country, and the water of the Darling were raised a sufficient height, it could be diverted into the Willandra Billabong.

7461. There are no natural features of the country which would prevent the water from being diverted? Whoever gave evidence about the waters meeting may have been right, but I think he must have been wrong, because I know all the country about Woore and Booroondarra to be hilly country—mallee ranges.

7462. But what I want to know is whether—if the elevation is not too great to prevent the water from being diverted—there is anything in the soil or the surface of the country that would prevent it; is it sufficiently good holding ground? It is of a red, porous nature. It would hold water in a canal, but it would be impossible to make a canal through that country to carry the water back from the Darling.

Holding ground.

Mr. G. C. Tompson. 27 May, 1885.

7463. But supposing that it is possible, would a canal hold and carry water? Yes.
7464. Do you think the evaporation in the canal would be too great to carry the water any distance? I do.
7465. In the paper you read you gave a list with the values of the runs in this district at the time they were taken up, and down to the present time? Yes.
7466. You gave the value of runs in 1880, and you mention that one run was sold for £10,000: what is the value of that run now—has it increased in value? That is not my valuation; it is what the run brought. Value of runs.
7467. But has it increased in value since? No.
7468. Why? Because the value in 1880 was a fictitious one altogether. I mentioned that because in 1874 several runs were forfeited because £20 rent was put upon them, and in the same year two runs changed hands for £45. In the year 1876, when the drought was in the inner districts, the sheep were forced from the inner districts out through this country for grass. At that time, the winter of 1876, the country was looking magnificent, and the sheep after three months, were taken back fat. Afterwards the blocks ran up to £300, £500, £1,000, and upwards. Before the runs were stocked the people on the frontages said that catches for water could never be got on the back blocks, but when the country was stocked it was found after the first rain that the ground became hard in consequence of the tramping of the stock, and that there were watersheds to be availed of as the country was undulating.
7469. And in 1880 you knew one block to bring £10,000? Yes; I knew one block that was forfeited in 1874, because a rent of £20 was put on it, to bring £32,000 when stocked, in 1880.
7470. And you knew a naked block to bring £10,000 without any improvements? Yes.
7471. Is that block worth £10,000 now? I have not seen it for the last two years and more.
7472. Was it worth £10,000 in 1880? It was not.
7473. And still it brought it? Yes.
7474. Why was it not worth £10,000? That is my opinion.
7475. And if artificial water has been made upon it at various points, do you not think it is worth £10,000 now? I would not give it.
7476. What is the size of the block? 100 square miles.
7477. You have shown that the country has increased in a marvellous manner during ten years: do you think that increase will go on as artificial water is made? Nearly the whole of the country is improved now by the conservation of water in tanks. Improvements.
7478. But supposing that it is still further improved, do you think the value will go on increasing in the same proportion? No, I do not think the value will go on increasing. Value.
7479. Then if a man gives £10,000 for a block of country that will not carry stock at all, and he conserves water so as to make it capable of carrying 10,000 sheep, you think it is not worth as much as when he bought it? I am not considering that block at all, because it was not worth the money paid for it.
7480. But the value of a block is what it will bring in the open market? I do not know about that; but that block was bought privately.
7481. At any rate, in the opinion of the man who bought it, it was worth £10,000? He might have thought so at the time—he has been sorry for it since.
7482. He is on the country still? He is on the adjoining country.
7483. Then you think the Cobar country you refer to in your paper will not increase in value even if artificial water is made? I say that it is improved by artificial water now up to its full capacity. During the last three years the runholders have never been short of water, but they have been short of grass. At one time it was thought that in the Cobar country you could never conserve sufficient water for the stock until they ate off the grass, but the squatters now find that they have more water than will enable them to feed off the country. Cobar country.
7484. How near are the tanks to each other? It all depends. There might be a large tank at the corner of four paddocks. That would be an average of about 5 miles. Tanks.
7485. And do you think that one large tank will keep as much stock as three or four tanks distributed over the paddocks? No, because the sheep going to water at one tank cut up the grass more. If you have several tanks on a station the sheep do not do so much injury to the grass. Number of tanks.
7486. Then if there were two tanks where there is now one the run would carry more stock? It might carry more stock; but, as I mentioned before, the back country is already well improved by the conservation of water. On a block of 100 square miles you could certainly carry more stock with four tanks than if you only had one large one.
7487. But I will put the same question with respect to 20,000 acres? On 20,000 acres a tank in the centre would be ample without any other tanks, provided the block were square.
7488. That does away altogether with the value of small paddocks and plenty of water? If you had a tank in the centre of a 20,000-acre block, the sheep would not have more than 2 miles to travel.
7489. But supposing they had not half a mile to travel, do you think then that more stock could be carried? No, I do not think any more stock could be carried on the back country; on the frontage there might.
7490. What effect has water distributed from rivers, tanks, or dams on this grass in the back country—does it affect it as it does elsewhere—does plenty of water make plenty of grass? Of course; but I have mentioned that formerly in that part of the country, owing to the loose nature of the soil, if we had 50 points of rain it used to go into the roots of the grass; whereas now, owing to the hard crust formed on the surface by the tramping of the stock, the water runs into flats or tanks. Grass and water.
7491. If you irrigated any portion of that country would the effect be beneficial? It would. Irrigation.
7492. Would it produce fair crops? It would—very good crops indeed.
7493. Then if there was plenty of water and means of irrigating in the back country you think good crops would be grown? Yes.
7494. And would it improve the grass lands? Yes, irrigation would improve the grass.
7495. Then if there was an unlimited supply of water throughout that country, do you think the persons in the neighbourhood would avail themselves of it, if they could get the water on to the soil? Yes.
7496. Is there much country alienated in that direction? Very little, except around the mines. Alienated land.
7497. If there was plenty of water there, would the country carry a fairly large population? Yes, a very large population. Population.
7498. It is very good wheat-growing country, is it not? Yes; want of water is the only drawback; the land would grow wheat if a sufficient quantity of water could be obtained during the year. Wheat.

7499.

Mr. G. C. Tompson. 27 May, 1885.

7499. During what part of the year is rain necessary for wheat-growing? The crops ought to be in in March, and then if we had rain during March, April, and the winter months the crops would be ripe for cutting about November.

Seasons. 7500. As the seasons are at present you do not consider the rain sufficient for wheat-growing? It is not.

Irrigation. 7501. Do you think that if the station-holders had sufficient rain to grow crops they would grow any quantity for storage? If they had water they would.

Area. 7502. Do you know of instances where irrigation has been resorted to even on a small scale in that country? Yes; on Anyon's selection, on the road from Cobar to Louth, about 20 miles from Cobar.

Water. 7503. What size is the selection? 40 or 80 acres. Water is obtained from a little shaft which the selector has put down.

Soil. 7504. Was there plenty of water? No; there was a sufficient supply for a few human beings and one or two horses; a portion of ground had been cultivated and had a crop of wheat upon it.

Result. 7505. Was the soil red soil? Yes. About three years ago the selector showed me his crop, which he said was a failure. He had a dam on the upper side of the crop; he made a drain through his dam and conducted the water to the cultivated land, and the crop sprang up splendidly after the ground had been once or twice irrigated.

7506. And you consider that that instance clearly demonstrates the possibility of growing wheat if only plenty of water can be obtained? I do. I may mention another instance. The whole of the Cobar country was very bare, and people there said that nothing would ever grow. An old man named M'Guinness, on the other side of Cobar, fenced in a tank to keep the squatter's sheep from it. After a shower of rain the overflow from the tank passed over his enclosed land, and I saw grass there over 9 inches high. That was a proof that with sufficient water grass would grow on the country.

7507. At the time you saw the grass was the surrounding country bare? Yes, every bit of it.

Garden Irrigation. 7508. Do you know of any other places where irrigation has been resorted to? Not except for gardens.

Water supply. 7509. State generally what you know? The gardens in the back country are all kept up by irrigation.

Result. 7510. Is the water obtained from dams or from wells? All from dams or tanks.

Soil. 7511. Are they successful? Very successful. The red country will grow anything far better than the black soil.

7512. Is there a very large area between the Lachlan and the Darling? A very large area indeed. The red country, I may mention, is of a less saline nature than the black soil—it is that which causes it to be so good.

7513. *Mr. Targett.*] Does the red soil extend right to the river banks? In very few places—there are very few places where you can trace the red soil out to the Darling. At Gundabooka Station there is a high red bank, and the lessee thought he could carry the water out back by means of pipes for the stock. He employed a surveyor to take the levels, but they found before they got out 15 miles that they were 200 feet above the bank of the river.

7514. *President.*] Was the point at which the lessee attempted to take the water out at right angles to the Darling? Yes.

Floods on the Bogan. 7515. Can you give us any particulars of the flood of 1879? Yes. In 1879 all the red Budda sand ridges out from the Duck Creek were under water. The Bogan at this time was of very great width—in some places I should think it was 4 or 5 miles wide. I may mention that the best water-hole in the Bogan is at Golgolgon. There is an overshot dam at the lower end of Charlton Run on a bar of rocks; it is upwards of a mile in length, and deep; it is a natural bar of rocks across the river, about 50 miles above the junction with the Darling, up the Bogan.

7516. Is the country very flat above that bar of rocks? On the east side it is flat country, but on the west side it is ridgy country.

Storage water-holes. 7517. What I want to know is, whether if a dam were thrown across that bar of rocks there are any natural basins above where large quantities of water could be stored? There are water-holes, but it would not be advisable to put anything across that bar of rocks; it would be better to put a dam up higher, and that would be the means of conserving a large body of water.

7518. But why not raise the bar of rocks? Because you would flood all the low-lying land on the east side.

Natural basins. 7519. Are there no dry creeks, ana-branches, or natural basins where large quantities of water could be stored? You would have to confine the water to the channel of the Bogan. There are several creeks to the east of the river. If you raised a dam on the rocky bar you could send the water on the eastern side into Broomi Creek. The lessee of the Charlton Run did not bother about the Bogan River, but he put dams in the Broomi Creek, which runs parallel with the river.

Creeks.

Broomi Creek.

Dam. 7520. But if a dam were raised to any height on the reef of rocks you speak of, would any quantity of water be conserved by it? Yes, if you raised it to a certain height; but it would not be advisable to do it, because the money could be spent to greater advantage by going higher up.

7521. But you have said that if a dam were put on that bar it would store a large quantity of water? Yes; but if you put a dam there do not make it higher than the river, because the moment the water rises over the bank it will flood the country to the east. It would be advisable to put overshot dams in the Bogan above Gilgoonoo.

7522. But that would only be to conserve water in the bed of the river? That is all.

Basins. 7523. There are no natural basins? There are one or two; but all the country to the east is low-lying country, and you could only really conserve water in the bed of the Bogan River.

Silt. 7524. *Mr. Gipps.*] Is there much silt in the Bogan River in times of flood? Yes, I should think there was a great deal.

7525. *President.*] Has any silting ever taken place at that bed of rocks you spoke of? I do not think so. I may mention that there is a Chinaman's garden on the Gongolgin waterhole, where the finest crops are grown that I have ever seen. I may mention also, with regard to the overshot dam at the lower boundary of Charlton Run, that it throws the water back 5 miles, or rather it did; I have not seen the dam now for years.

Overshot dam.

Distribution. 7526. With reference to the country you were speaking of before, it is simply a question of levels as to whether or not water can be distributed over that country, and if it can be distributed it will make the soil very prolific? But I say that it is impossible to distribute it.

7527. But it is only a question of levels? Yes. If there was sufficient water on the country to irrigate it the country would become most valuable for agriculture. At Winbar, I should like to mention, when the Darling rises to a sufficient height it runs into a warrambool which goes out 5 miles from the river.

The Darling

Mr. G. C. Tompson.

27 May, 1885.

7528. Is there a bar across the river below the take-off? Not that I know of.
7529. And that warrambool is dammed—with what result? That a large body of water is conserved.
7530. Are there any other large dams or warrambools you wish to give the Commission any information about? No, not any others. You were talking about a sort of dividing range—I believe there is a dividing range running along by Nymagee. The fall seems to be towards the Darling below Wilcannia, and the fall from the ranges on the east side of Nymagee runs into the Darling below Bourke. Dividing Range.
7531. Then both fall towards the Darling? Yes. I consider that range of rocks at Nymagee is a dividing range. Fall.
7532. One watershed running into the Darling at Wilcannia, and the other below Bourke? Yes.
7533. Do you know if the supply of water in the Yantarra and Cobham Lakes is permanent? It is not. Yantarra and Cobham Lakes.
7534. Do you know of any means by which it could be made permanent? I do not.
7535. Not from the overflow of any rivers? No. About 10 chains from the Queensland border, on the Onepar blocks, there is a magnificent water-hole in what is known as Wampah. It is in the county of Tongowoko, right up in the north-western part of the Colony. In the creek where the banks on both sides are very high and rocky, a large body of water could be conserved by a dam at the lower end of that water-hole. The Wampah. Dam.
7536. What area of water could be conserved? The length of a full mile. Back water.
7537. By what width? By a width I suppose of 2 chains. Width.
7538. That would not be a large conservation? The depth would be great.
7539. To what purpose could the water so conserved be applied—could it be diverted into any of those lakes? No; only for local purposes. From the Wampah water-hole the creek is well defined. It runs down past the point of Mount King, where another creek comes in from the west, after which it forms itself into what is called the Whittabreena Creek. Whittabreena Creek.
7540. Are those creeks shown on any map? Not that I know of. After that it heads away down, and I believe runs into the Yantara Lake.
7541. Have you any idea how often the Wampah Creek runs? It only runs after heavy rains. The heads come in from Queensland. I believe it is part of the Booloo. Supply.
7542. Is it east or west of Carypundy Swamp? It is west. The overflow from the Yantara Creek runs into Tarawoto Swamp. The water I believe runs from Tarawoto Swamps into Yancanya Creek. A little further on, beyond Yancanya Creek, and between Yancanya and Tonga Stations, there are high ridges, to the south-east of which and into the Momba, at the lower end of the Paroo watershed, I believe the water from Yancanya Creek runs. Tarawoto Swamp. Yancanya.
7543. Can you suggest any means by which the flow of that water into Yantara Lake could be facilitated? No. I may mention that when the country near the Wampah is fully stocked there can be no doubt that the ground, which consists of stony ridges, will cause the rainfall to flow more readily into the creeks I have described.
7544. Have you anything to say with reference to Cobham Lake? That lake is filled from Evelyn Creek. At the head of Evelyn Creek is the Depôt Glen waterhole, which is in a deep gorge between two very steep slate hills. A large quantity of water could be conserved there by means of a dam at the lower end. Evelyn Creek.
7545. What length of dam do you think would be required? One from 2 to 3 chains wide. The sheet of water in the hole is upwards of a mile in length. Dam.
7546. Over what area of country would a dam throw the water? It would not throw the water back far, because the country rises at the back. Back-water.
7547. What is the height of the banks? Between 50 and 70 feet high.
7548. If the dam were made up to the height of the surrounding ridges, what area of country would be covered? Not a large area, because the country falls very quickly. It would be about 10,000 acres. Area.
7549. To about what depth? The channel above Depôt Glen is about a mile in length. Depth.
7550. But would there be 10,000 acres of this deep water? No, it would include the deep water and the water at the back. A high dam would throw the water round the head of the waterhole. It has a good large watershed, because there is a sort of natural creek or watercourse, running into it for 5 or 6 miles.
7551. About how many miles square would the watershed be? About 5 miles square. The question of damming this creek would be of sufficient importance to justify further consideration, as it is the main supply for the stock of people living in that part of the Colony. Watershed.
7552. But you only consider it is worth troubling about for storage for the immediate use of stock and residents? That is all. Purpose of storage.
7553. Not for the purpose of irrigation? No. Below Depôt Glen, just opposite Poole's grave, there is another good water-hole in Evelyn Creek. These are the holes that Sturt and his party were camped at for twenty-one months in 1840 and 1841. They could not get away, owing to the want of water. They had taken a boat out with them, believing the whole place to be an inland sea; and that boat, I believe, was on the water-hole opposite Poole's grave when Mr. J. C. Woore visited the place in 1863. After that date I believe the boat was washed down the creek and broken up, thus showing that there could not have been any floods between 1843 and 1863, or else the boat would have been previously washed away. About 4 miles further down the creek, on the left bank, there is a well 90 feet deep, containing a supply of beautiful water. That well has been used to water stock, and I believe has never gone dry. Water-holes. Floods. Well.
7554. What quantity of stock would it water? I should think it would have watered 10,000 sheep. Supply.
7555. Is the well in existence now? It is still in existence. It was the only well the gold-diggers could get their water from. 2 miles lower down, at Milparinka, there is a very fair water-hole, where a large quantity of water could be stored by the erection of a dam. Milparinka. Dam.
7556. What height would the dam require to be? You could make it as high as you please. In Evelyn Creek there is a well-defined channel all the way down to Cobham Lake. That lake was dry about 1882. The overflow from it runs south-west.
7557. Is there any means of damming the water in Cobham Lake, so as to make it permanent? No, I do not think so. Cobham Lake.
7558. Can you suggest any means by which Cobham Lake could be made permanent? No, I could not suggest any means at all. There is a salt lake east of Cobham Lake, or a little to the north-east. The water in it is as salt as the sea. That lake gets its drainage from the north-east. Salt Lake.
7559. Is there any means by which the drainage into that lake could be taken into the Cobham Lake? Yes, I am sure of it. As you ride along you pass a number of hills, and if you could cut one of these Diversion.

hills

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hills off you could divert the watershed from the north portion of the salt lake into Cobham Lake; but it would not be worth while, because Evelyn Creek in heavy rains fills Cobham Lake.

7560. Could you not dam the outlet to Cobham Lake? Yes, you could by an overshot dam. An earthen dam would break over the sides, and carry away down the overflow creek.

Boulka Lake.

7561. Then you do not think there is any means of improving that lake? None. Boulka Lake is a very good one; it is on the border between New South Wales and South Australia. The creeks flowing into that enter from the north.

7562. Is that a permanent lake? No.

7563. Are there any means of making it permanent? I could not say. I have never been at Boulka Lake.

Well. Rise.

There is a good well at Mount Stuart Run, 138 feet deep, which strikes a splendid supply of water 104 feet 6 inches from the surface. The water will rise in the well 31 feet in one night.

Well.

7564. Do you know what formation is passed through in the well? I do not now remember the strata.

7565. Do you know any other well out there? Yes; there is another well on Sturt No. 4 Block. The lessees put down a well, and struck a fair supply of water at a depth of 130 feet. There is a good well at the head of Bunker Creek.

Warrego overflow.

7566. Do you know any other water? Not in that part. The overflow from the Warrego in Queensland comes down through North Darling back block No. 10, and North Darling back block No. 15, into a cane-grass flat. That water could be brought down on to the North Darling back blocks.

7567. Does any quantity of water come down there? Yes, I have seen the water run in regular creeks through these blocks.

Springs.

7568. Are there any wells up there? Yes. There is a spring at No. 16 called Shearer's Spring, and there are some good springs on the North Darling back blocks Nos. 12 and 18. On No. 17 there is also a very good spring.

7569. Are these mud springs? No; you just open them out and the water runs.

7570. What sort of springs are they? They are all rocky springs, and when opened out the water runs from them.

Supply.

7571. Is there any quantity of water? There is one spring that watered 7,000 sheep; the others are not so good.

Quality. Warrambool from Balloon.

7572. Is the water good? Excellent water. There is a warrambool coming from the Balloon, west of the Mooni; I have seen that running; it runs right round, coming in just on the boundary between Millera and Boorroomma. I have seen that running in a regular channel the whole way down into the Barwon. There are also splendid wells on Burrawandool and Boorara Runs.

Wells.

7573. Are they deep or shallow wells? Shallow wells, in a sandy drift; they furnish a splendid supply of water.

7574. Are they artesian? No; the water remains in the shaft. On Muggarie back block B there are splendid wells; also on Pinegobla and on Bukkulla.

7575. Then on the whole, in this country lying between the Narran and Barwon, water is obtained in numerous shallow wells? Yes, it is obtained chiefly in gum sand-ridges. There are wells at Dungalear back block No. 3, and on the Plumbola blocks. There is a good spring at Camborah, and a capital natural water-hole at Grawin. There is also a capital warrambool which comes out of the river Barwon just at the top boundary of Dungalear, and runs out about 4 miles from the river and into the river at Ulah, a distance of about 40 miles. There were two dams on that warrambool, which threw back a large quantity of water, but they were carried away in the 1876 flood. The water was over the whole surface of the country; it was a sea of water right up to Ginghe, on the frontage.

Protection of dams from floods.

7576. What means could be adopted to prevent a repetition of the washing away of dams like that? Only by protecting them with stone sides.

7577. That would protect them you think? Yes.

7578. And making a by-wash? Yes, of course. You could flood all the country between the warrambool and the Darling. At that time I went from Ginghe Station up to the town of Walgett in a boat across country; the distance is about 4 miles.

Natural basins. Overshot dams.

7579. There are large natural basins for conserving water in the warrambool, by making dams? Yes, generally the creeks going through that part of the country should be dammed with overshot dams—not earthen dams. I have never approved of earthen dams, because they are too costly for repairs, and the earth that goes into the channel of the river helps to fill it up. The Mara also requires to have overshot dams; at present there are earthen dams there.

7580. Have you any theory with reference to the underground water which produces the mud springs between this and the Queensland border? No.

7581. But you know of their existence? Yes.

7582. And they are found in a number of places? Yes, they are.

Mud springs.

7583. *Mr. Gipps.*] Are there many of these mud springs on the west of the Darling? On the north-west side there are a great many of them.

7584. You could not travel any great distance without coming on them? They are isolated.

Wind.

7585. What is the prevalent wind in the summer, west of the Darling? From south-west to north-east chiefly.

Windmills.

7586. Are they sufficient to admit of windmills being used? Yes.

Rain-wind.

7587. What is the prevalent rain-wind? The north-east.

Irrigation.

7588. In both summer and winter? Yes; that is for general rain—thunder-storms come up from anywhere. I may mention, with reference to irrigation, that it was tried on the black soil at Winbar and proved a failure. They put a large steam pump on to a lagoon to pump the water towards the river over the low-lying land. No grass grew there afterwards. The lignum became green, but no grass ever grew. The lucerne in a paddock, over which water from the river was pumped, grew splendidly.

7589. *President.*] Do you think irrigation could be carried out to any reasonable extent if there was plenty of water at command either on the frontages or back country? Of course, if you had sufficient water you could always make any thing grow on the back country.

7590. But how about the frontages? On the frontage the soil is of a very saline nature, and it does not seem to answer very well.

7591. Do you know of any other instances on the frontage where the surface of the soil has been prepared for irrigation—either scarified or broken? No.

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7592. And your experience relates simply to places where the water has been thrown over the natural surface? Yes.
7593. Do you know of places on the frontages where Chinese and others have gardens? Yes.
7594. Do they irrigate with river water? Yes, and with the well water. The river water is far preferable to the well water.
7595. But both will produce vegetation on the frontage? Both; but the ones watered from the river produce better vegetables than those watered from wells.
7596. But suppose irrigation were tried on the frontages on a large scale, and under a system of ploughing or scarifying, do you not think the water would have the same effect as in the Chinese gardens? Yes, it might have.
7597. And the reason you consider that it has not that effect now is because no pains are taken to prepare the soil for the water? I think that is it.
7598. If there were plenty of water at hand, do you think the squatters and others would take advantage of it? I am sure they would—that is by an easy process—just letting it on; they would not go to any expense in putting it on.
7599. But if they went to any expense, it would be a calculation whether it would pay them; if it would pay them they would do it? Yes; but now the railway is out here it would not pay them.
7600. What do you estimate would be the cost of growing hay if water was at command? It would all depend upon how you put the water on. Cost of hay.
7601. Supposing it were put on without undue expense, say at a cost of £1 per acre per annum? 40 acres would produce from 80 to 120 tons of hay in the year if the land were irrigated once a month during the time the crop was in.
7602. But what would be the cost per acre of dealing with the land and taking the hay off? About £2 per acre.
7603. That is, to put in the crop and take it off? Yes.
7604. You say that 40 acres would produce from 80 to 120 tons, or 3 tons to the acre, and that the cost of putting it in and taking it off would be £2 per acre—that would be about 13s. per ton? Yes; in fact there is some land in the county of Mouramba which I am confident grows a crop of 4 tons to the acre.
7605. *Mr. Gipps.*] In one crop? Yes. I have seen oats as tall as I am growing there.
7606. If the cost of irrigating the land is estimated at £1 an acre, that would make the cost of producing the hay £1 a ton? If it cost £1 an acre to irrigate the land, the hay would cost about £1 a ton to produce.
7607. What is hay worth here? About £10 a ton.
7608. *Mr. Barton.*] Speaking of the rainfall here, you said it was not sufficient to grow wheat: do you know what the rainfall is in the north of Adelaide, where wheat crops are grown successfully? I have no idea. Rainfall.
7609. Do you not think that if the rainfall here, or even less, were regular, we could produce cereals? Yes, if we had the rainfall. The rainfall here averages only 13 inches in the year.
7610. I think you will find that Mr. Russell's record shows 20 inches? I always thought it was about 13 inches. Of course this year has been an exceptional one. I am speaking of the country out back—not that on the frontage. I always considered the rainfall there about 13 inches in the year. But even if we could have the 13 inches within three months we could grow anything at all; but when it comes in 20, 30, or 40 points it is of no use at all.
7611. Do you not think that cereals could be grown in favourable positions here three years out of every five? Yes. Cereals.
7612. Are you aware that at the Shearlegs, 30 miles the other side of Cobar, they have grown crops every year without fail for the last seven years? Yes.
7613. Are you aware that they have cut this year already as many as three crops of lucerne? I am not aware of it, but I dare say they have.
7614. Without any irrigation at all? Without any irrigation. I may mention the Shearlegs lies in a flat, and that it has been proved that a sort of drainage passes underneath the flat.
7615. Do you not think that there are other flats in the same position to be found if you looked for them? I am sure of it.
7616. You said that the Gongolgan water-hole was formed by a natural bar of rocks, or natural overshot dam? Yes. Gongolgon waterhole.
7617. Do you consider that the fact of the Gongolgan water-hole not silting up would of itself prove that if overshot dams were erected at suitable places they would not silt up either? No, they would not—the current would carry any silt over. Silt.
7618. Have you seen any silt in the Bogan except the very fine mud held in solution? No, I have not.
7619. *Mr. Gipps.*] You say the current would carry the silt over; but how about the spot in the river where the back-water would be first filled? It rises pretty high on the overshot from the head of the Lachlan, and there is a tremendous current in the Bogan when it is in flood, and any silt would be soon swept down. The silt is more likely to lie in the Darling. In the Bogan, you can take your horse in the water without fear of his being bogged; but you could not do that in the Darling, which shows that the silt in the two rivers is different. Current in the Bogan. Silt.
7620. What is the character of the soil? In the Bogan it is sandy, but in the Darling it is muddy. There is a greater fall in the Bogan, and the current carries it off. Soil.
7621. *Mr. Barton.*] Do you think that if there had been railways communicating with the far west, they would have been the means of saving large numbers of sheep which have died in consequence of the drought? I am sure of it. Railways
7622. And do you think that it would be good policy on the part of the Government to provide means of transit for sheep from those places to other places? I think so. Transit for sheep.
7623. Do you know the present Travelling Stock Act well enough to say whether you think it presses hardly on squatters when they want to travel their stock to feed them? Yes, very heavily indeed; because you might be suffering from a drought on your run, and if you can't get any paddocks within 40 miles of you you have to take your stock over that distance, and then remain away several months before you can return to your station. Travelling Stock Act.

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7624. Do you think it would be wise to alter that Act so as to allow squatters to move their sheep anywhere and bring them back after rain? Yes.

7625. And do you think it would be wise to grant power to the Sheep Boards in any district to give permission to remove stock from one place to another, in order to save their lives? Yes. From what I know of the Sheep Boards, they would be suitable persons to whom to entrust that power.

Legislation.

7626. *President.*] Do you think it is necessary to legislate for the purpose of giving water rights or regulating the distribution of the water from the various watercourses throughout this Colony? I think it would be a very good plan indeed. For instance, supposing a person is situated here on a creek, if he makes a dam to conserve storm-water, he should for a certain number of years at any rate be entitled to (say) 3, 4, or 5 miles of the water, as the case might be—in consideration of his expending a sum of money in putting a dam across the creek.

Rights to water.

7627. But the question is as to dealing with rights above or below points where water is conserved. Supposing a man puts a dam across a creek or river, the man below may think he has some rights taken away: do you not think that a law should be passed regulating those water-rights, so that there could be no dispute? Then they should be overshot dams, so as not to divert the flood-water from the channel. A man should be allowed to keep the channel full, but not by means of large earthen dams to throw it back for miles. On Pine Creek, between the Namoi and the Gwydir Rivers, on the Burran Burran Run, a large dam was constructed which never let the water get below it.

7628. And you think there should be legislation to regulate water-rights generally? Yes, I always thought so; that was proved on these rivers wherever people put large earthen dams.

Mr. John Little called in and examined:—

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7629. *President.*] Where do you reside? At Curraweena, in the Bourke district.

7630. Do you know anything concerning the Yanda Creek? Yes, it goes through my run.

Yanda Creek.

7631. What is its source? I believe its source is near Cobar; I have never traced it beyond Cobar.

7632. Is the country beyond Cobar much higher than the Yanda Creek where it goes through your run? Yes, I think so.

Dams.

7633. Are there many dams on Yanda Creek? I know of five.

Back-water.

7634. Do they back up any large quantity of water? After the rains of January they did; I never saw so much water in the creek as there was after the January rains.

7635. Is the water permanent? I do not think it is.

Depth.

7636. To what depth do these dams back up the water? 10 or 15 feet above the excavation. I have an excavation in front of the dam, and the dam is made of the earth from the excavation.

Banks.

7637. What is the reason why you do not think the water is permanent? In prospecting for a site for the dam I have found the banks to be in drift, made by the action of the water at some time or other.

Soakage.

7638. And do you find that the water soaks away? Yes, until it gets into the excavation, and there it stands. The surface above the bed of the creek consists of drift, which allows the water to go through. I made puddled drains at the base of the dam, filled up with good clay. In places I went from 2 feet to 15 feet in these puddled drains before I could get suitable holding-ground; the sand would hardly stand while the men were doing the work.

7639. Then before you could construct permanent dams on the Yanda Creek you would have to adopt some means to prevent the water from percolating through the porous strata? Yes.

7640. And your experience is that it does get away? Yes, quickly.

7641. But the ground, when excavated, holds well? Yes.

Banks.

7642. Is the creek of any size? It is pretty shallow. The banks are not very high on each side; but during the January rains, when you could see the extent of it by the water, it had the appearance of a stream like the Darling itself in ordinary times—wide, but shallow.

Country.

7643. What is the nature of the country about the Yanda Creek? Undulating.

Storage.

7644. Do you know of any points on the creek where large quantities of water could be stored between ridges or anything of that sort? No; the creek runs through undulating country, but the ridges are not of any size to permit of a dam stopping any large quantity of water.

Soil.

7645. What is the nature of the soil? It is red, porous subsoil—a good rich soil.

7646. It would produce, with plenty of water, a large amount of vegetation? I cannot speak from experience, but I should say so. You can get any quantity of vegetables by giving water.

7647. Is it good wheat-growing soil? I think so.

Value of land.

7648. What is the difference between the value of the country improved and unimproved? Unimproved it is valueless, or was when there was very much of it unimproved.

7649. And it is of considerable value when fairly improved by the conservation of water. Oh yes.

7650. And I suppose the improvement varies in value according to the quantity of water that can be stored? Yes.

7651. That is, the improvement over the whole of the country? Yes; the drawback is in the water being so scarce.

Wells.

7652. Do you know of any wells in the neighbourhood? Yes; I sank three wells on the Glenariff country.

Quality.

7653. With what result? The result was water, but it was not good. It was salt water, or water containing some mineral substance which made it unsuitable for sheep or stock, and the supply was inadequate for any large number.

7654. It was a pure supply of water? Yes, in all cases.

Depth.

7655. Have you sunk to any great depth? The deepest well was 280 feet.

Bed.

7656. What was the bed you came upon? Granite; I sank 100 feet through the granite.

7657. Do you know of any wells in the neighbourhood of the Yanda Creek? There is an old shaft on Curraweena on Yanda Creek which was sunk to a depth of 80 or 90 feet, and tapped salt water. It was not persevered with. I do not know anything about the supply, but the quality was not suitable for stock.

Supply.

7658. Do you know of any instances where wells have been sunk down to the granite, or where a plentiful supply has been obtained? In my own case I went to the granite and into it 100 feet, but I did not get a supply. I do not know any other place where a plentiful supply of good water has been got in any well between the Bogan, the Darling, and the Lachlan.

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7659. Then do you consider that any large quantity of water to be stored in or diverted into that country must be over the surface by means of a canal from some river or by tanks and dams? I would rather say that I believe it could be accomplished by artesian borings; it is my impression that there is an artesian supply of water in the locality if it could be reached. Artesian supply.

7660. And do you think it is worth while to prospect for artesian water? Yes.

7661. And after that the only other means is to conserve as much surface water as possible? Yes. Surface water.

7662. Suppose you could divert a portion of the Darling, the Macquarie, or the Bogan waters through that country, do you think it is practicable to convey it in a canal, or do you think the evaporation or soakage is too great? The evaporation of water is great, but the supply of water might be greater; it would depend upon the supply. I have no doubt that if a canal were made the water could be supplemented by the drainage from favourable spots along the route. Diversion. Evaporation. Canal.

7663. By storing water to supplement the water in the canal? Yes.

7664. All along the course of the canal? Yes.

7665. *Mr. Barton.*] What kind of places do you mean—springs? No; there are no springs in this district. Yanda or Mulga Creek might be utilized in that way.

7666. *Mr. Gipps.*] But you said that the soil was porous for some feet? There are other flats where a large quantity of water could be conserved and led away in the manner I speak of. I am speaking of the country between Nymagee, Cobar, Nyngan, and Bourke. Porosity of soil.

7667. There are no natural features to prevent a canal from being taken through that country, if the levels do not prove that the country is too high? No. Canal.

7668. The surface water is suitable? I think so.

7669. *Mr. Murray.*] With reference to the carrying capacity of these 10 mile blocks, do you know what the average stock on them is at the present time? It is very much below their capacity. Stock on runs.

7670. What would you say was the average quantity of stock these 10-mile blocks are carrying now? 10,000 I should say, at the outside.

7671. Is that an increase on former years? No, it is a decrease.

7672. What have they carried? 15,000.

7673. How long ago was that? Say from 1879 to 1882.

7674. Can you go back as far as 1875 and say what they carried then? No; as far back as 1876 there were very few runs in the country carrying anything at all.

7675. Then from 1879 to 1881 they were stocked up to about 15,000? No, they were not stocked up at that time; the lessees were improving—making tanks and fencing.

7676. When did they reach their maximum capacity? In 1882.

7677. And the falling away has been due to the drought which has occurred since? Yes.

7678. Was it as much want of water as want of grass that caused the falling off? Both in about an equal degree.

7679. If you had plenty of water, could you keep up your stock with the salt-bush and other edible herbs? No, I do not think so. These herbs suffered from the want of natural moisture, and in many cases were not palatable to the sheep.

7680. You think the runs are not stocked up now to their full carrying capacity? No.

7681. To what extent could they be stocked? To a third more than the present quantity.

7682. They have been stocked up to one-half more? Perhaps. There are instances in which they were stocked up to more than they would carry. The country was young, and perhaps was in a condition to carry more than it ever will again.

7683. Have you ever suffered from want of water in this district when you had plenty of grass? Yes. Water and grass.

7684. Then you think it might be of advantage if this country could be supplied with water? Decidedly.

7685. Then though you might have a dearth of grass you would keep a greater quantity of stock? Yes, the stock would be better distributed over the country if there were plenty of water; instead of going to one place for water, they would have different points to go to without having to travel far.

7686. Have you made any observations with respect to evaporation? No, but I know it to be great. Evaporation.

7687. Take a dam of 20 feet: if the water were not used for stock, how long would it remain before it evaporated? It would last through any drought, unless the soil were porous.

7688. The percolation is not very great? It depends on the nature of the soil; it is difficult to find suitable soil for holding purposes. Percolation.

7689. *Mr. Barton.*] You have had a great deal of experience in this back country during a number of years, and in other parts between here and the Lachlan? Yes.

7690. And you were connected with squatting a great many years previous to that? Yes.

7691. What do you consider to be the highest commercial value of any unimproved block of country between the Darling and the Lachlan, or the Darling and the Paroo? The value of the blocks depends upon the facilities for making water. Value of blocks.

7692. I am speaking of unwatered blocks? Well, it would depend upon the natural facilities there were for making water on the blocks.

7693. Well, take the best of them, or a fair average of them? £1,000 I should say was the value of any block in its natural state.

7694. *President.*] That is a 10-mile block? Yes.

7695. *Mr. Barton.*] What do you consider it would cost, on the average of the back blocks you have seen here, to provide permanent water for all the stock you ought to carry on 100 square miles? To improve it up to my idea of what it should be, I should say it would take £4,000. I should think it would take six tanks distributed over a square block, at a cost of about £4,000. Cost of water conservation.

7696. You are aware of course that in this district, and over a great part of the western country, more than one-half of the sheep have been lost during the late drought? Yes.

7697. Do you think that if there had been railway communication into the far west, it would have been the means of saving a large proportion of the sheep that have perished? Yes, I think so. Railways.

7698. Are you of opinion that it would be a wise policy to make special arrangements to provide for the transit of sheep in great droughts? I am.

7699. Are you of opinion that the Travelling Stock Act presses very heavily on squatters in time of drought, when to travel their stock to a distant district is the only chance of saving their lives? I am. Travelling Stock Act.

Mr. J. Little. 27 May, 1885.

7700. Are you of opinion that it would be wise in the Government to place in the hands of the various District Sheep Boards the power to grant permission to travel stock to other districts for the express purpose of saving them, and to regulate their return? Yes; their practical knowledge would guide them in deciding whether it was or was not wise to do so.

Temperature. 7701. *Mr. Gipps.*] What is the highest temperature you have known, east of the Darling? 124 degrees in the shade.

Hot winds. 7702. Are hot winds frequent? No, they are not frequent.

7703. Nor continuous? No.

7704. What effect do they have on vegetation—on the grass, scrub, and trees? A very withering effect. You may see by the vegetation the effect of a hot wind, immediately it has passed by.

Springs. 7705. Do you know of any springs east of the Darling? No.

Overshot dams. 7706. Are the dams in the Yanda Creek overshot? No.

Silt. 7707. Do they silt up or raise the bed of the creek at all? I have not had an experience sufficiently long to enable me to say. The Yanda Creek has only run once during my knowledge of it.

Ground. 7708. What is the character of the excavated ground? It is good holding ground in the bed of the creek, and generally black soil where the dams are put, that being the best soil for holding.

7709. That is beneath the porous soil that you said could not hold water? Yes, the porous soil is on the banks on one side or the other.

Water-holding capacity. 7710. Then comes the black clay, which is good holding ground? Yes, black or red clay.

7711. *Mr. Targett.*] Does the red soil hold water well for tanks? If you get a certain depth, from a foot to two feet from the surface; but it is generally of so porous a nature that it does not hold water. In many instances puddling drains have been made outside the dam to this depth to get the water.

Puddling. 7712. Is it usual to puddle? No, it is only in exceptional cases that it has been tried.

7713. Does it improve it much? It depends on how it is done; if it is done with good clay, and faithfully, it does improve it.

Soakage. 7714. It does away with almost all soakage? Yes, there is nothing lost except by evaporation.

7715. If there were plenty of water in the country you refer to, for irrigation purposes, do you think any of the lessees would grow fodder? I think they would all avail themselves of the privilege to the greatest extent, and they would be prepared to pay a reasonable rate for water.

Winds. 7716. *Mr Gipps.*] What are the prevailing winds in summer and winter? Westerly winds. The north-westerly winds bring the dust-storms. The south-westerly winds in the winter are cold and dry.

Windmills. 7717. Are they frequent and continuous, so as to be suitable for windmills? The westerly winds are. The prevailing winds are from the north-west and south-west, in winter.

Rain. 7718. *Mr. Targett.*] What winds bring the heaviest rain? The north-east winds.

Profit per sheep. 7719. *Mr. Murray.*] What do you think is the profit per head on sheep in a fair average season? It is so long since I saw any profit that I could scarcely answer that question right off. When the country I am in was in a condition to yield profit the drought came and obliterated all hope of profit.

7720. *President.*] But take a fair season? I will say 3s. per head. The quality of stock and other conditions would raise the profit probably above that, but that would be the average.

THURSDAY, 28 MAY, 1885.

At Nyngan.

Present:—

MR. GIPPS, C.E., | MR. M'MORDIE, M.I.C.E.,
MR. LYNE, M.P., | MR. MURRAY, M.P.,
MR. TARGETT, M.P.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. John Readford called in and examined:—

Mr. J. Readford. 28 May, 1885.

7721. *Mr. Murray.*] How long have you resided in this district? Forty years the 14th of last month.

7722. Then you know a great deal about the district? Yes, I do; I was down within 3½ miles of Murrawonga (Richardson's place) in 1845.

7723. Do you know the Macquarie particularly near Warren? Yes.

Macquarie floods. 7724. Have you seen the flood-waters of the Macquarie passing into the Gunningba Creek? Yes, and likewise into the Beleringa Creek.

7725. Do you think it is practicable to draw the Macquarie water so as to get a supply in these creeks? I think so. I have seen the river several times in the year within a foot of running into them. If there had been a dam across, the Macquarie would have filled it and irrigated a large extent of country as well.

7726. Do you think it is possible in the same manner to get the supply in the Bogan supplemented from the Macquarie? 7 miles above Warren would be the place to put one of these dams.

7727. Warren is on the Macquarie? Yes; but you must recollect that there are two Warrens, one on the Castlereagh, and one on the Macquarie. A dam there would throw the water into the Gunningba Creek, and also into the Beleringa Creek. Both of those creeks run into the Bogan.

Permanent supply. Irrigation 7728. If a permanent supply were maintained at a high-level in the Macquarie, and also in Beleringa, Gunningba, and Duck Creeks, do you think that irrigation could be tried in many places? I think so; the water would irrigate of itself to a large extent. It would be about 3 miles on each side of the river, and the further you went down the wider it would get.

7729. *Mr. Gipps.*] How would you carry out the irrigation? By weirs and sluice-gates to let the water off as required. People who have come from England have told me that it would have been done there long ago.

Supply. 7730. *Mr. Murray.*] If the Macquarie were dammed, would it be practicable to draw a supply from the east side of the river as well as from the west? Yes.

Dam. 7731. *Mr. Gipps.*] What height would the dam require to be? A little higher than the bank, which is 17 or 18 feet high.

Mr. J. Readford. 28 May, 1885.

7732. Do you know of any lagoons or natural reservoirs, such as depressions, in the neighbouring country? Yes. The Bird's-nest on the Beleringa Creek, and the Burlong Hole. The Burlong Hole holds water for two and a half years, and the Bird's-nest will hold it nearly three and a half years.

Holding ground.

7733. *Mr. Murray.*] As a rule, does all the country between the Macquarie and Bogan retain water well? It holds it very well; the cattle have puddled it to a considerable extent. When first I came here it would not hold. That country as a rule does not hold water because it is not puddled. I have seen the Beleringa Creek run with local rains, and I have seen it running in the winter-time and dry in February. Some of the holes will hold water eighteen months.

Water and grass.

7734. Have you suffered much from want of water in this district? Yes, but more from want of grass. When the holes I have been speaking of are full they will hold out longer than the grass. The greatest drought I ever saw here was in 1851, when the diggings broke out. I lost 2,500 head of cattle in no time.

Mara Creek.

7735. Do you think that works such as have been mentioned are necessary for the development of this country? I think so. There is another place at Mumblebone, 20 miles below Warren, on the Macquarie; a dam there would fill Mara Creek and would back up the river I should think 10 miles or more.

Wells.

7736. Do you know anything about the wells? I know a few at Nevertire. There is one 160 feet deep on Ryrie's run, but they only get a little water out of it; it was not bad water.

7737. Are there many wells in the district? I have tried one about 5 miles on the west side of the river, and got very good water at a depth of 44 feet—4 feet of permanent water.

7738. Are the wells in the vicinity of the Macquarie affected by the rise and fall of the river? Some are, and some are not. Down along the river there is gum, and wherever there is gum you can get water.

Supply.

7739. Have you ever tested any of these wells to know what their capacity is? The only one I tested was one at Warren; you could draw night and day at that without bringing it down an inch.

7740. Can you say what quantity of stock could be watered from that well? I think it would water any amount of stock if the water could be pumped out. The well is 150 yards from the bank of the river.

Wells.

7741. Do you know of any wells back from the river? I know of one at Nevertire, but I do not know what water it contains. I know a well that was put down on the Marthaguy Creek a depth of 180 feet, but there was no water in it. Mr. M'Gregor sank one at Merrigale on the Duck Creek, 7 miles from where the other was sunk, and he got very good water at 180 feet.

Bottom.

7742. *Mr. Gipps.*] Are those wells bottomed on rock? It is a hard substance, but I forget what sort of material it is. In the well I sank at Warren we came on a sort of sand rock.

Rise.

7743. Did the water rise in the well? As soon as the sandstone was struck the water rushed in up to the neck of a man who was working there; the water came in almost as soon as he struck his pick into the sandstone.

7744. Did the water rise to any height in the well? 35 feet.

7745. How far from the surface? 65 feet was the depth of the well, and the water rose 35 feet and kept at that for some time.

Supply.

7746. You could not pump it lower? They tried with buckets night and day for two days and a night, but could not reduce the water. That well is within a few yards of the Macquarie River. Anywhere within 8 miles of the river any person can get plenty of water, but back from there you cannot. The well in which I got 4 feet of water is 8 miles back from the river. The supply there was all that I required, and I did not try to go lower. On Day's run they have watered a place called Trowan. They got it at a depth of 18 feet. It lasted very well for some time; but there is gum there. In some of the wells about Warren you go through a lot of drift, and in the well I am speaking of they went through a sort of clay all the way down until they came to the sand-rock.

Strata.

Water conservation.

7747. In your opinion, what is the best system that could be adopted in this district for the conservation of water? I think the best thing would be to try to put those two dams we were speaking of.

Sites for dams.

7748. If these dams were constructed, to what distance from the river do you think they would be able to supply water? I think the best place to put a dam would be in the river, because that would give a continuous supply. You could make the water flow into the creeks I have spoken of.

7749. Are the banks of the Bogan higher than the country at the back? I do not think you could do much there. The place to dam the Bogan would be where those half-moon places come out, about a mile or half a mile away; that is the best place for a dam to keep the water in the river; but I do not think you could send the water far out on the plains. I have seen the river in a flooded state, but the water was never far back from the river.

7750. *Mr. Targett.*] Where would you propose to tap the Macquarie to fill the creeks? 7 miles above Warren for the Beleringa and Gunningba Creeks, and 20 miles below Warren for the Mara Creek. Further back than that you want tanks, because you cannot throw the water from the river without great trouble.

Tanks at Nevertire.

7751. Will tanks hold well? Yes, if you put them in the red ground, but they will not last any time in the black soil. You need to look for a good catch. The first tank I sank at Nevertire I paid 3s. 6d. per yard for the excavation, and during the drought of 1866 it watered 300 head of cattle and 300 head of horses. In my opinion, a tank of 10,000 yards, when the water is pumped out of it, will hold more water than an 18,000-yard tank into which the stock are allowed to go, because the stock take as much out on their carcasses as they drink. I used to keep a man on purpose to pump the water into troughs as it was required.

Evaporation.

7752. *Mr. Murray.*] Is the evaporation very great here? It was not in the tank I am speaking of.

7753. How long did the water in the tank last without rain for the number of stock you had? For eighteen months we had no rain.

7754. And you had water all that time? Yes, the tank never was dry while I was there; but after I left, a lot of sheep were allowed to go round it and the manure ran in. I had fenced it in, and would not allow a beast inside the fence. It would not have been dry now only for that.

Pumping.

7755. Then you think that a dam will last a great deal longer if you pump the water out of it to supply the stock than if you allow the stock to go in? Yes, I am sure of it, and pumping is easy; I had a Californian pump.

Dams.

7756. Do you know of any other dams in this district? No, I have never been out to any other dam. I know that Mr. Flood has a dam that never went dry on the Merri Merri, and there is one at Bungle Gully, Evans's place, between the Castlereagh and the Namoi. That has been there for years, and never went dry; it throws water back 12 miles, and is the smallest dam I ever saw; it is not more than 10 feet across.

Mr. J. Readford. 28 May, 1885.

7757. *Mr. Targett.*] Had it a by-wash, or was it overshot? I do not know; I only saw it as I passed. It is twelve or thirteen years ago since I was there.

7758. Is it still in existence? Yes.

7759. What area of country does it throw water over? I do not know; I only went past it.

Width.

7760. How wide is the water at the dam? Not very wide—about 20 yards; but when you get higher up it is wider—so wide that they have to keep a boat.

7761. What was the width at the place where you saw it? 50 or 60 yards I should think.

The Macquarie.

7762. *Mr. Gipps.*] Is the Macquarie always flowing at the sites you propose for the dams? No; we get floods perhaps five or six times a year, and sometimes we are short. The Macquarie will not hold water a long time.

Silt.

7763. Does much silt come down the Macquarie in flood-time? Yes, there is a great deal sometimes.

7764. What is its character—is it sandy? Yes.

7765. Do you know of any springs in the district? No.

Winds.

7766. What are the prevalent winds in summer and winter? From the west or south-west, and we never get any rains with these winds.

Windmills.

7767. Are the winds continuous, so as to allow the use of windmills? Yes, they are.

Diversion.

7768. Would the diversion of the Macquarie into the creeks deprive the channel below of water? No, the water would run in again from the creeks, and if there were flood-gates there the water could be regulated.

Waste of water.

7769. *Mr. Targett.*] I suppose a great quantity of water runs to waste in flood-time? Yes, it runs into reedy marshes.

Sluice gates.

7770. *Mr. Gipps.*] Do you think that the use of sluice-gates and an overshot dam would influence the flow of the water down the Macquarie? No, I do not think so.

7771. How far is it from the place 20 miles below Warren to where the Mole dips? It is about 60 miles, or nearly so.

Waterholes.

7772. Are there deep waterholes between the proposed dam and the end of the Mole, in the river? Yes. There is the Graway Water-hole—that is a large hole I have never known to be dry; it is like a natural dam.

Rocks.

7773. Are there rocks near? I do not know—I never examined that point. The place where Beleringa Creek forms is 8 miles above Warren, and it runs into the Gunningbar Creek, 25 miles below Warren.

Beds of creeks.

7774. What is the character of the beds of these creeks—sandy? Yes, but not much in the Beleringa Creek. There is a little in the Gunningbar Creek—it is what is washed out of the river. That creek overflows nearly opposite to Cannonbar; some part of it goes into the Bogan, and some part into Duck Creek.

Mr. T. L. Richardson called in and examined:—

Mr. T. L. Richardson. 28 May, 1885.

7775. *President.*] You are an old resident here, Mr. Richardson? Yes, I have been on the Bogan since 1860.

7776. And you have station property in the neighbourhood of the Bogan and Duck Creek? Yes.

7777. The Duck Creek runs into the Bogan? Yes.

7778. Does it come out of the Macquarie? Yes.

Duck Creek.

7779. Is it a running stream always, or only in flood-time? Only when the floods are coming down, or after heavy rain.

Dams.

7780. Is it dammed to any considerable extent? I think there are only one or two dams on Duck Creek. There is a small and overshot dam below Cannonbar—the country there is perfectly flat.

Back-waters. Fall.

7781. Do the dams back the water any distance? Yes; the country has such a slight fall, not more than 3 feet in the mile. I have dammed the water back for 5, 6, and 7 miles, that is, on Duck Creek. Duck Creek is the biggest creek in the western district—bigger than the Castlereagh River.

Diversion.

7782. Could any quantity of the water of the Macquarie be diverted into Duck Creek by a small cutting? Not into Duck Creek, which takes out of the Macquarie at a very high level, 12 miles below Warren. The Gunningba Creek is the easiest outlet for the Macquarie water.

7783. Would it be necessary to dam the water of the Macquarie? You would have to dam it to get it a sufficient height. If you dam back 6 feet of a head it would be sufficient, I think, from what I remember of the ground.

Permanent supply.

7784. Would that produce permanent water in Duck Creek? As long as the Macquarie ran; but it is not very much, you know; it has stopped several times within the last twelve months.

Natural depressions.

7785. Do you know of any natural depressions in the neighbourhood of that country where water from the Macquarie could be stored in times of flood? I know of none except the channels of the creeks—the country is too flat.

Soil.

7786. Do dams stand well on Duck Creek? Yes; the soil is fine clay.

By-washes.

7787. Do they have by-washes? You must have them; we have tried overshot dams, but we can do nothing with them.

Stability of dams.

7788. How do the dams stand? If you provide a good natural by-wash running a sufficient length before it joins the main stream again a dam will stand for years; I have two a few miles from here that have stood for years.

7789. Have you to take care that they do not cut? You cannot do anything in that way.

7790. Do they cut when the creek is running? Not if you provide a sufficient slope—they fall away with a very small slope. That is, supposing I provide a get-away or by-wash of a mile in length the fall in that would be more than 3 feet. There is so little current, and there is consequently very little scour. The natural surface is very difficult to dealt with, being sugary and soft, and if you are not careful you cannot do anything with the by-wash. My experience is—provide natural by-washes; do not attempt to make them, or you will throw away thousands of pounds if you do.

Current and scour.

The Bogan.

7791. You are well acquainted with the Bogan River? I am.

Dams.

7792. Can you give us any particulars of dams made across that river? Yes; I know nearly every dam from here 80 or 90 miles downwards. The first dam you come to is across the river, between Mr. Aaron's run and my brother's run, about 10 miles from here. It has a big sheet of water in it now—I was looking at it this morning as I came along. It backs water about 4 miles up the stream. The Bogan there is very insignificant; it varies very much in its depth and size.

7793. *Mr. Targett.*] Is the water at that dam permanent? Yes, it has never been dry.

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7794. *President.*] What other dams do you know? There was another dam about 3 miles below the first, but the get-away was too short, and the water formed another creek. It stood, however, about seven years. The next dam is what I always call the Big Dam, between my brother's two runs. That stood for eight years, until during a rise in the river twelve months ago the water ate through it. I wish to explain, with reference to earthen dams, that during long droughts, when the water has gone down very low in the dam, the bank becomes very dry and cracks all through, and we cannot always be attending to it, so that the first rush of water eats through the crack, and you come twelve or fourteen hours afterwards and find your dam gone. If any one were there to puddle up the creek when it occurred the dam would be saved. That dam was repaired shortly after, and is now full of water, which is backed up about 5 miles. The dam was repaired at a very slight cost—about £100. It is about 21 miles from here. It is a splendid natural get-away which goes out miles through the bush and joins the stream further down, forming a great natural cowal. It is the finest natural get-away on the Bogan River. The next dam is 26 miles from here, and is also between the same two runs of my brother's. It is as full as it can hold, right up to the banks; I suppose there is about 16 feet of water at the dam head. The water is backed up by the foot to the other dam, and the water is swimmable all the way from the one dam to the other. They are nearly 4 miles apart, and you cannot cross anywhere between them without swimming. Big dam.

7795. *Mr. Targett.*] What is the difference in the levels? I cannot tell—I can only make a rough guess. I should think there is a fall of 10 or 11 feet in the 4 miles, and that would make, as I said before, a fall of about 3 feet in the mile. There are no other dams until we get 70 miles from Nyngan, owing to the false economy of my neighbours, who will not pay a share of the cost of making a dam so as to fill Duck Creek. The river itself does not require it—it has big banks and permanent holes. Then there is a dam between my holding and Mr. Kyter's; it has a very deep natural get-away, but does not slope back more than 5 feet of a head of water, because the natural get-away is so very deep. There is another large dam which I have been two years in erecting, but it got carried away in the last flood before I had it finished. There is another dam lately erected on Mr. Hall's Nidgery run; that I believe is full of water at the present time. I believe there are none again until you get below Gongolgan, on to Mr. Randle's run. That is as far as I know. Fall. Dams.

7796. *President.*] Is the soil on the Bogan where these dams are made of the same sugary character as that you described as being on the Duck Creek? Yes. Soil.

7797. Is the ground along the banks good holding ground for water? Very good; most of the ground is not sugary—it is a good clay.

7798. But the ground that you say melts away if you attempt to open a channel, that I suppose is sugary? It is not a solid clay, but it is clay that will wash away with the scour of water; it is clay mixed with loam and other material.

7799. But there is no perceptible loss of water by soakage? Yes, there is; the greater the head of water, the greater the loss by soakage. The part of the bank that is above the natural line of water goes very quickly. When you first stop a dam full the water will go down nearly 3 feet before it comes to a standing level. Soakage.

7800. Supposing the country in the neighbourhood of the dam were used for watering sheep, would not the sheep puddle it sufficiently by their treading to prevent the loss? It would to some extent, but it would not effectually stop the soakage, as the soakage takes place before the ordinary head of water—when the water is up to the top of the dam.

7801. Is the soakage principally in the banks or in the dam? It is in the bank, not in the dam.

7802. Then according to that, it is scarcely wise to attempt to raise water above a certain level? The water must go by its natural get-away; we stop it as much as we can.

7803. Supposing the water could be kept up to a certain point close to the top of the dam and not materially lessen, the soakage would cease? It is not possible.

7804. You said just now that if you filled the dam beyond a certain point which is the ordinary head of water, there would be great soakage? Yes.

7805. But if you made the ordinary head of water lower, still the soakage would take place between the two points? No, I do not say that it would take place in the same proportion, but there would still be some; perhaps it would be only one-third of what it would be at a higher level.

7806. What is the cost of erecting those dams across the Bogan? They are not very costly. Of course it all depends on the size of the stream. The cost is generally from £250 to £500. The dam I have that carried away cost from £700 to £800, and it is not complete yet; but then I could not find a natural get-away and I had to make big wings to throw the water into a gully below. That is what made the extra cost. I have made a dam across a big stream for £300 which stood for years. Cost of dams.

7807. Do you think it would be a wise plan to erect dams on the Bogan wherever facilities offer for doing so, and to store as much water as possible in the bed of the river? I should most certainly say so; there is no other way of conserving water. Storage by dams.

7808. Do you find the landowners and others living below the dams object to the dams being placed across the river? I do not, excepting those miserable, parsimonious men who object to erect a dam themselves. No man objects unless he objects to pay his share. The mere local catchment between one dam and another will give enough water, without saying anything about floods.

7809. Does the erection of these dams across the river seriously affect the flow of water down the river in ordinary times? Well, every dam has to be filled before the water can run down. Supposing you had no other means of filling the dams but the floods which come down the stream—which is not the case, because the local rains give you a good supply—I think then it would be very objectionable; the men at the head of the Bogan would get all the water. But that has not been our experience; we always find that we get all the water we want without the river running through at all. Flow in river.

7810. Do you think it would be wise to frame legislation to deal with the question of obstructing the water, and giving power to either corporate bodies or the Government to deal in a broad and practical way with the whole subject? I certainly think so. I think the question should be dealt with—that is, the question of conserving water by means of dams. Legislation.

7811. What is the nature of the floods in the Bogan—are they rapid or sluggish? They are sluggish. Floods.

7812. And do you find that when they come down there is a large amount of silt deposited? No, the only silt deposited that might injure the stream is immediately below the big dam; it is the silt of the scour of the by-washes. Silt.

7813. But you have not found the river-bed above the dams to silt up? I think it does a little.

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7814. But not to a damaging extent? Not to a damaging extent. Unquestionably they silt up, because the water is full of mud which settles.

7815. But do you know of any appreciable silt in your dams and the dams you are acquainted with on the Bogan? It is about 6 inches in seven years for a mile above the dam, decreasing beyond that.

Width of floods.

7816. Which amounts to about 1 inch a year? Yes.

7817. Does the flood-water extend out from the bed of the Bogan at flood-time? Yes; when you get 60 miles below Nyngan the Bogan breaks out on both sides of my country and goes 3 or 4 miles out into cowals or natural watercourses. I have known the Duck Creek to do the same in high floods.

Effect of floods.

7818. And when the Bogan breaks out like that, is the effect upon the land as good as that of manure? Undoubtedly it enriches it very much.

Soil.

7819. Is the soil along the Bogan and towards the Macquarie good prolific soil? It is very rich soil, provided it has a good season and plenty of moisture.

7820. Do you consider it soil on which almost anything could be grown? I think it is soil that would grow anything.

Irrigation.

7821. Have you tried to irrigate to any extent? No.

7822. Do you know any case in which people have irrigated on the Bogan, such as gardens? No.

7823. Is it your opinion that if there was sufficient water in the Bogan or stored in such a way that it could be obtained for irrigation on a limited scale the landowners along the river would avail themselves of it? I do not think so; I think it would be only on a very limited scale that you could use it, because we never can store more than enough to last through a severe drought without taking anything out of it.

7824. But supposing the water was there in an unlimited supply, would the people avail themselves of it for growing produce and storing hay for their stock? I could not say.

Farmers.

7825. I suppose there are not many farmers in this district? There are none.

7826. Would many small holders of land resort to farming if they had water for irrigation? It is hard to say what people will do; if one man starts, he may set an example which his neighbours will copy.

Evaporation.

7827. Have you any idea or any practical experience of what the evaporation on the water surface is? No, I can only speak of evaporation combined with soakage—that is, the actual loss.

7828. What experience have you had in reference to that? For some years I had a very large body of water stored in a dam on Duck Creek. I used to raise a million gallons of water a day with a centrifugal pump, and let it run away; but I found that the water appeared to go as fast when I was not pumping as when I was pumping a million gallons a day.

7829. What size was the sheet of water? It was 18 feet deep at the dam head, and went back for 5 miles.

7830. From that you could not give the Commission any detailed account of the evaporation? Not of the evaporation. I consider that the evaporation was about the same as the soakage. After the water had got down to the standing level I thought as much went by evaporation as by soakage. At first I used to hold back a good head of water so that I could raise the water without much difficulty, because, in using the centrifugal pumps, if you have to lift the water high you cannot raise nearly so much as when you have to raise it a less height. By pumping up a great head of water I could throw 600 gallons a minute more.

Distribution.

7831. From your experience of the country between the Macquarie and the Bogan, do you think it possible to dam more rivers and raise the water so as to distribute a portion over the country lying between? I do not think so. I think all you can stop in the Bogan would be otherwise required; it would not do to take it away for other purposes.

7832. Do you think the same with regard to the Macquarie? No, because it is nearly always running; the Bogan is very different.

7833. If the water could be stopped in the Macquarie, is the country flat enough and low enough to admit of the water being thrown over the surface in a great many places between? From a certain distance below Dubbo it is flat.

7834. And once you get the water to a certain height you could distribute it by gravitation? You could. There would be no trouble so long as you went up stream—not down stream.

7835. I mean going from the Macquarie towards the Bogan? Oh, I think so—it is all about one level.

Wells.

7836. Do you know of many wells sunk in this part of the country? No, very few. I sank one out on the West Bogan country about twenty years ago.

7837. With what result? I got brackish water; I did not go on with the well.

7838. Do you water all your stock here from dams? Dams and tanks; no wells.

7839. Do you know of any artesian water having been found between this and the Darling? No, I never heard of a drop of fresh water being obtained between here and the Darling fit for drinking; perhaps if you went to artesian deposits you might get it down about 200 or 300 feet; there is none fit to drink.

Hay.

7840. Do you know of any instance here where squatters and others are cutting natural grasses for hay? I know of only one instance; my brother just below here has about 100 tons cut.

Cost.

7841. Have you any idea what it cost him a ton to cut it? It cost him £1 per ton; his manager told me this, knowing that he had worked in the most economical way possible.

7842. Is he intending to cut any quantity for the purpose of storing? No, he does not think he may want that for about three years.

7843. *Mr. M'Mordie.*] Do you know the country west of the Bogan River and north of the Lachlan? Down to Cobar I do, but not south of that.

Diversion from the Bogan.

7844. From your knowledge of the physical features of the country, would it, in your opinion, be possible to divert water from any point of the Bogan to any considerable distance in the country in a westerly or north-westerly direction? I think it would be quite impossible, because the country rises; as soon as you get 10 miles out anywhere on the west side of the Bogan you get on to ridges which rise as you go further westward; I should think the country in the middle is 300 feet above the level of the Bogan.

7845. Does that difficulty get greater or less as you go further up the Bogan? I think it gets greater; that is to say, I think the country of the Upper Bogan towards the Lachlan becomes more hilly as you get away from the river.

Elevation of country.

7846. *President.*] Do you think the country between this and Nymagee is higher than the Bogan at Obley? No, I do not think that; it gets gradually higher; I have never been out to Nymagee.

7847. Is the other country up about Bolgandramine equally high with the country between the Bogan and south of Cobar? I think it is higher; I should think it is 600 feet at Nymagee, and 300 feet at Cobar.

Mr. T. L. Richardson. 28 May, 1885.

7848. Is the country between the Bogan above Nyngan and the Lachlan fairly high and ridgy country? Yes, judging from what I have seen of it; I have not seen much of that country.

7849. Is there much or little wind in this part of the country as a rule? There is a great deal of wind, especially in summer. Wind.

7850. Is there wind enough to drive windmills? Yes, there is; but of course there are many days when you get no wind at all; you might, I should say, reckon one day in every two, or perhaps one in every three.

Water rate.

7851. If a scheme were adopted to divert a portion of the Macquarie water into the Duck, Gunningba, and Mara Creeks, at a moderate cost, do you think the landowners benefited thereby would be willing to contribute towards the cost in the shape of a rate? I do not think so, but I may be wrong; squatters as a rule have always had to help themselves, and if they think a thing is worth doing they think it is worth while to do it on their own account.

7852. *Mr. M'Mordie.*] Even without security of tenure? Oh, they chance that; they would do a great deal more if they had security of tenure, no doubt.

Supplying dry country.

7853. Can you make any suggestions as to the means of supplying the dry country between the Darling, Bogan, and Lachlan, with water? None beyond the means we employ now, namely, dams and tanks.

7854. That is, local tanks? Yes.

7855. Is the country you have just spoken of good wheat-producing country? Yes.

The Rev. J. Milne Curran, F.G.S., called in and examined :—

Rev. J. M. Curran. 28 May, 1885.

7856. *President.*] Have you resided any length of time in this part of the country? Yes, for some years; not exactly in Nyngan; I have been travelling over the district for some time past.

7857. Generally everywhere? Generally everywhere in the inland parts of New South Wales.

7858. Have you made a special study of the geology of this part of the country? Yes, I have always made use of any opportunities I have had for observing facts connected with geology, also the water supply of the district.

Water supply.

7859. And what has been the result of your observations in reference to the water supply of the district? I think it is better that I should give an outline of what my observations have resulted in. I will speak first about the surface water, and then give what evidence I have about the underground water. My evidence refers principally to the underground water supply, and what I have to say with regard to surface water is simply the result of observations I have made during the time I have been in the district. In the first place, with regard to the surface water, I think that if the country about here could be irrigated that, as far as soil is concerned, it would grow anything, but I think that a good deal that has been said and written about irrigating this inland country has been the result of comparisons made with other countries where the physical conditions are different. A great deal has been made of the example of India, but we have no Ganges here, and I think that to talk of cutting canals from the Macquarie or Bogan to irrigate the country on any grand scale is idle—not that the canals would be impossible, but because we have not sufficient water in the rivers. The Macquarie has been dry for months past, and the Bogan only flows a few weeks during the whole year; but if cutting of canals to irrigate the country would succeed anywhere I should think that it would succeed about Wellington, as the fall of the river is more per mile there than it is anywhere lower down. But with regard to surface water, I think that a good deal could be done by making dams on natural depressions so as to store flood-waters. With regard to the constructions of dams I cannot give any evidence, not having had any experience.

Surface water.

Storage of flood-waters.

Irrigation.

7860. If it could be proved that the rainfall in the eastern and hilly part of the country is sufficient if conserved to irrigate to even a limited extent, and if the water could be stored in natural basins at the heads of the rivers, do not you think a great deal of good could be done in carrying water by canals and irrigating various parts of the low-lying portions of the Colony? I think so, but the most we could do would be on a small scale compared with the country which requires to be irrigated.

California.

7861. Do you know that the rainfall in some parts of California is less by a great deal than the rainfall in Australia, and yet that they are carrying on irrigation works there on a gigantic scale? But I understand that the canals always come from running rivers. My deductions about irrigation are taken principally from India. I do not think much could be done in that way. In the first place, if we had magnificent catchments at the heads of the rivers, the rivers do not flow continually enough, as far as my experience goes.

7862. Supposing that the flood-waters of the Macquarie were conserved at the heads in the large basins which are there and the flow from the river was kept constant from the reservoirs, do not you think that a great deal might be done in the way of irrigation? I think so, but I have no faith in the amount of water that comes down the river to keep the dams supplied.

7863. That, you will allow, is a matter of calculation between the rainfall and the watershed and the soakage and the evaporation? Yes.

Evaporation.

7864. Have you had any experience of the evaporation which takes place here? No. I am inclined to think that it would be far more than is calculated by Mr. Russell, on account of the prevalence of hot winds. With regard to the underground supply, I take it for granted that the rainfall is far in excess of what is accounted for by evaporation or the outflow of the rivers or by soakage, and of course from the geological point of view I want to try to account for the water that disappears. I think that a glance at the geological history of these great plains will explain this in a great measure. The diagram which I produce is an enlargement of a plate prepared for the Linnean Society of New South Wales. Vol. X. (*Appendix Z.*) A B would represent the fall of the Macquarie before the plains were deposited, for I take the plains to be an alluvial deposit, and so the work of the rivers.

Underground supply.

Geological history.

7865. The whole plain country? The whole plain country.

7866. North and south? North and south. When I speak of the plain country, I should say that no one theory respecting the underground water supply will apply to all the interior, because the physical conditions are different. By the interior of New South Wales I mean all the country north of the 33rd parallel and west of Dubbo. So different are the physical features throughout that country that no one theory is adequate to account for the underground water supply. In that country I distinguished three districts—the plain districts, what I call the tertiary plains or the Merri Merri country, coloured green on the geological map of the Government. The

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next division is the Silurio-Devonian country or the Cobar-Girilambone country. I call them by those latter names because the country around those places is typical of the whole area. The third district comprises the Warrego or cretaceous country. In discussing the underground water supply we have to consider these three districts separately. With regard to the underground water supply on the plains, I think the geological history of the formation of the plains will explain where the water goes to. AB will represent the fall of the Macquarie before the plains were deposited. All those plains are alluvial. The first proof of that is that the material of the plains at the greatest depth known is the same as the deposit of the river at the present time, and we find at various depths shells of different species that now inhabit the Macquarie. It may seem a vast amount of work to attribute to a few rivers, but it is not without parallel in other parts of the world. All this material brought down represents the amount of denudation in the upper valleys of the river, just as railway contractors when they cut down a hill use the material to fill up a valley. AB represents the original fall of the river. As the plains were deposited the river had to take levels as at C.D and E, while at A, say at Wellington, the level of the river is practically unaltered, or, if anything, is eroded, so that we have as the plains were formed rivers on different horizons; and the remarkable part of this is, that all this must be connected with the present river at some one point. This will explain to a great extent what becomes of the floods that never come down the river, as a flood coming down at A has to get away at many places, and all those underground channels must be filled before the water can flow on the present surface. It might be objected to this that, instead of having various channels, we would have one great river deposit under the present channel. This would be altogether at variance with the way in which we see the river working at the present time. If every flood that came down deposited detrital matter to an equal extent over the whole of the plains then the river would never leave its bed, because when the river bed was raised the plains would be raised to an equal extent. But we find that the heaviest deposits are always on the banks of the river, so that the river and its bed rise above the level of the surrounding plains until at some time it breaks away and forms a new channel, so that we have old rivers beds not only at different levels or different horizons but also over separate areas.

Alluvial plains.

Underground channels.

7867. Then, according to your theory, the water that falls at the head of the river and is not accounted for by evaporation or outflow, permeates through these various channels? Yes, which channels are on different levels and over different areas.

Storage at heads.

7868. Then, allowing that to be the case, do not you think the best thing which could be done in the first instance is to store as much of the rain-water at the head of the river as possible, and prevent it getting away into those underground channels? I think it would be a good idea if practicable.

7869. But your theory is, that if you take the quantity of water that flows at a certain point in the river you will find, by taking the water further down on the plains, that there is a loss of water somewhere? Not all over the country—only in the country I am now discussing; for instance, we find no loss between the Fish River and Bathurst; it is only when we come on to the plains that we find a loss, and when we should expect the underground channels.

7870. Then if the water were stored after it came to Bathurst, or at any point above that where the plains encroach on the high land, the water would be prevented from going through the underground strata described in the diagram, and could be utilized on the surface? Most certainly.

Loss of water.

7871. Can you give the Commission any practical experience from your own observation of the loss of water in that way? Not exact measurements, but in travelling down the Macquarie I found the river flowing at Dubbo while it was perfectly dry at Warren; that was about two months ago. I explained how, in the formation of the plains, these underground river beds were left under the present surface, and, luckily for us, not at any particular point but at different levels and over different areas. I want to put particular stress on that point. If the present country were covered to a depth of 200 feet with an impervious layer of clay and you sank a well (say) over the present river Macquarie, directly you struck the drift in the present river you would get a supply of water, and it is a remarkable fact that in every well which has been sunk on these plains the water has always been in river drift, and when they do not find river drift they don't get water. Imagine this 200 feet of impervious clay over the present level of the country. If a well were put down at a place called the Macquarie Cataract, at Rocky Point, we should have an artesian well. If through this impervious layer a shaft were put down the water would rise in the shaft, and we should have an artesian supply, for this reason: AB in diagram 2 will represent the present Macquarie; AC will represent our imaginary deposit of 200 feet. At point F, the present cataract of the Macquarie, there is a bar of rock across the river. If this deposit of clay were placed over the present level the water could not get away over this rocky bar, but would keep it back until it reached the point where the new surface touched the high lands, which would be about Wellington. Now the water not being able to get away at B, and the impervious layer of clay AC preventing its rising in that direction, if a bore were put down at D the water would rise in that bore exactly to the same height as A, where the new surface encroaches on the high lands. Something like this has taken place in the past and we have some examples of it; in fact there was a well sunk in Mullengudgeric, 16 miles from Nyngan, on the railway line, in which no water to speak of as tapped until at a depth of 64 feet they struck the old river drift, and immediately the water rose 40 feet. Then, with regard to the capability of rivers to do such work as laying down these plains, I think that whatever private opinion may be on the subject, very few geologists will dispute the fact. As a matter of fact, when a flood does come down it will always leave a deposit of from 2 to 3 inches over the plains, particularly over the banks of the river, and I have seen fences which were erected within the memory of people now living covered to the second rail by the deposit left by flood-waters. A resident of Narramine, Mr. O'Neill, informed me of a fact which is in keeping with my statement. He said that when it rains about Dubbo the water rises in his well before the floods come down the Macquarie, his well of course being sunk on one of these old river-beds. Now, with regard to the Cobar-Girilambone country, all through that district, as far as I have seen, the rock is never very far from the surface.

Artesian supply.

Cobar-Girilambone country.

Formation.

7872. What is the rock? All silurian and Devonian slates, schists, and limestones; and, from a geological point of view, we have every reason to think that water ought to be got in many places in this area in wells, particularly in the Devonian country. I have noticed that in very dry times in some of the Cobar-Girilambone country the creeks hold a great deal of water, which I cannot say is water flowing underground, but the sand holds a great deal of water at many points. I want to draw the attention of the Commission to an easy means of getting water in country of that description from the sand-beds. The information may be found in an article on Abyssinian tube wells published in the transactions of the Royal Society

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Society of Victoria, vol. 22. With regard to the Warrego or cretaceous country, I cannot speak from personal knowledge, but we know enough of the geology of the cretaceous rocks to expect to find artesian water in that district.

Artesian wells.

7873. Do you know if any artesian wells have been found south of the Darling in the country you first described? Yes, many, for instance at Mullengudgeric.

Rise.

7874. Do you know of any case where the water has flowed over the surface? No, and in accordance with the diagram it would be hardly likely that it should occur, particularly when we consider the nature of the strata the water has to rise through. The further down you get along the rivers, the more probable it is that artesian water will rise above the surface. I think that over all areas the one great principle which was recommended to the digger in searching for gold should apply, viz., that you should secure all on the surface before you venture to look underground. With regard to the country between the Lower Lachlan and the Lower Darling, it resembles in all respects the country described as tertiary; and all that I have said with regard to the tertiary country applies to that, with this difference: that we should expect the deposits to be much deeper—that is, the deposits over the old river channels. In mesozoic times the South Australian country was raised more than 600 feet, and it is from that period that I date the origin of these plains, and it all depends upon what we do not know at present, viz., the exact extent and lie of the upheaval, what depth of alluvial deposits we should expect to find in this lower tertiary country. Of course all the facts and observations upon which I have come to the conclusions I have stated to you, I have not given, nor have I given any account of the wells that I know. I should be glad, however, if the Commission thought the information valuable, to throw it into proper form and submit it.

Country between Lower Lachlan and Lower Darling.

7875. In travelling about the district, did you find as a rule that the people you met took any interest in the question of water supply? None whatever; in the conservation of water of course they did, but in the underground supply I found that they took no interest whatever.

Fertility of soil.

7876. And do you find as a rule that the soil in the district is very rich and prolific? Yes, I think that the country is capable of growing anything, as far as the soil is concerned.

Population.

7877. Do you think that if there was a supply of water the country would carry a comparatively large population? Yes; water supply is the only question.

Water-rate.

7878. Do you think that there would be any objection to pay a reasonable rate for water if it could be obtained? On the contrary, I think they would be quite willing; I have heard more than one say that if they could get a stream of water flowing through a small paddock they would be independent.

Irrigation.

7879. Do you know of any gardens where irrigation has been carried on to a small extent? None, except the Chinese gardens.

Soil.

7880. Do you find their gardens here as prolific as in other parts? More so; I find that the soil is more prolific as you go from Bathurst to Nyngan, and requiring fewer artificial helps in the way of manure.

Local Trusts.

7881. Do you think that in the conservation of water on a large scale it would be wise to provide for the formation of districts to conduct their own works? I think that that is the only way by which practical results will ever be obtained—simply local government with regard to water conservation and supply.

Old river channels.

7882. *Mr. M'Mordie.*] At what stage of the geological process which you have described do you suppose that the old river channels were formed? The river at present is in its old age; the first channel was formed in the heyday of its youth. AB represents the river in the heyday of its youth; AE represents the present surface. The river channels to which I referred have been continuously in formation from the time the river occupied a level at B until it now occupies a level at C.

7883. Why in those particular drifts which you call the old river beds is the deposit different from the deposits above and below and on either side? Precisely for the same reason that we find the deposit in the channel of the present river different from the deposit on its banks.

7884. Is there any condition in process now between Bourke and Brewarrina which would at any future period constitute an old river channel? I cannot say that there is in the locality to which you refer, for this reason—that the time for those conditions is past in that part of the country.

7885. Do you suppose that those old river channels, where they exist, discharge water to the sea to any considerable extent? I cannot say; I know nothing about where the discharge goes to. That question has reference to a part of the country of which I have no practical knowledge.

Subterranean water.

7886. *President.*] Do you think that any of that subterranean water you speak of is found in the springs on either side of the Darling? I should think it probable, but I cannot speak from experience.

7887. You do not know of any instance where it reappears on the surface after disappearing? No, but I know of several instances where we have tapped it.

7888. And your supposition would be that it meanders away to some outlet, probably the sea? It is not necessary to suppose that it goes to the sea.

Subterranean lakes.

7889. There would be subterranean lakes now? A subterranean lake could hardly exist; there would be immense areas of pervious strata charged with water.

Subterranean current.

7890. Have you ever heard of an instance between the Murray and the sea in Victoria where water is found rushing rapidly from the direction of the Murray towards the sea? I have heard of instances occurring on the southern portions of the continent.

7891. Would you presume that that water made its way and discharged into the sea? I could hardly deduce anything more than the fact that it comes to the surface there.

7892. Do you know of any instance in this district where you have been able to detect the flow of the underground water? I think so; there is a well which was sunk by Mr. M'Lachlan, at Nevertire, in which I was told that there was a very decided flow to the north-west, which would be somewhat in keeping with the present drainage lines. One of the most remarkable facts in the history of continents is the permanence of drainage lines during long periods.

Wells.

7893. Was the water in that well found in drift? Yes; there is no exception. There is an apparent exception in the case of a well put down by Mr. John Kelly, at Myalmundy; but in that instance the well was in an old river drift, but consolidated so as to appear hard grit or conglomerate.

7894. Do you know how they tested the flow in the Nevertire well? A workman whom I questioned simply told me that the water all came in from one side. In keeping with the theory I have put before you as to what becomes of the waters which never come down the rivers, I have often noticed on the plains water flowing away from the creeks into great depressions, instead of flowing to the creeks, and then rushing

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into holes and disappearing; that is evidently connected with the underground channels. I should like to make a suggestion with regard to the conservation of flood-waters. Noticing as we do that the ground on the banks of the rivers is higher, and noticing how far back the waters go from the Macquarie, I think it would be judicious to run lines of levels from the banks of the Macquarie into the back country, at various places between Dubbo and Warren.

Levels.

7895. That is, for the purpose of ascertaining how far water could be sent by gravitation? And also ascertaining where, by a small expenditure, great bodies of water could be prevented from returning to the river.

7896. Have you travelled much over the country between this and the south of Cobar? I go to Mount Hope and Nymagee.

Conservatio of surface water.

7897. Can you offer any suggestions which might be of service to the Commission in trying to supply that country with permanent water? I think, as I said before, that the first care ought to be to conserve the surface water in that country. I do not think that much could be done by bringing water either from the head of the Bogan or the Lachlan. I have taken levels by the aneroid, and I think that all the country about Nymagee, Cobar, and the south is considerably above the level of the plains where we are at present, and down to Coonamble and the Mara Creek.

7898. But it is much below the level of the country about Wellington? Yes.

7899. And you know of no means which are likely to be successful, except by storing surface water and trying to ascertain if there is any subterranean water? And, as I suggested, in the sandy creeks which are so very common, I think that the use of Abyssinian tube wells would be of great benefit; they are so

Abyssinian wells.

inexpensive and so easily managed. I have known instances of wells put down on what are called gilgais, and water has been struck in every instance. The wells were put down on Hermitage Plains, Mr. Mahony's run.

7900. Is there any other information you can give the Commission? Not that I am aware of at present; but in case I might be misunderstood in speaking of the underground waters, I want to call attention to one class of wells in this district to which my observations do not in any way apply; that is to what I call surface wells, which are sunk in lenticular masses of sand, which rest on clay, and the water is simply

Surface wells.

rain-water which the sand has absorbed. They give good water for a time only. We have some of them about 2 miles from here.

Mr. William Allison called in and examined:—

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7901. *President.*] You live in the neighbourhood of Nyngan, do you not? Yes, I have lived here for five years.

7902. You have had considerable experience in squatting pursuits? Yes.

Dams.

7903. And in making tanks and dams and sinking wells over a large area of country? Yes.

7904. Do you find any difficulty in conserving water either in the Bogan River or in the dry creeks, or other creeks running into the Bogan, by means of earthen dams? No difficulty; the only thing necessary is to find a suitable place for making the dam; you cannot put a dam anywhere—you have to find a

By-wash.

suitable place, with a natural get-away or by-wash above the dam.

7905. And that is the most important feature to be noticed in selecting a site for a dam? It is the all-important feature to be noticed.

7906. Do you find the clay of such a nature as to stand the water well? Yes, in dams that I have. But the principal thing is to have a get-away sloping from the place where it starts to where it goes into the river again. It does not matter what the consistency of the clay is; if it has a steep fall into the river it is bound to go away.

Holding ground.

7907. And do you find all the clays and soils along the banks of the river good holding ground? Very good; of course when a new dam is put down the water invariably soaks at the surface.

Soakage.

7908. Does that lessen as the dam becomes older? Yes; still it is always a good deal, because the earth is left when the water soaks away, and when the dam is filled again it necessarily soaks away again.

7909. If the dam were kept fairly full that soakage would be still less? Yes.

7910. Do you know the Macquarie River very well? Not particularly.

Canals.

7911. Do you think any system could be adopted by which water could be carried in canals from the Macquarie or any other river in the neighbourhood, through the centre of the dry country lying between the Bogan and the Macquarie, by which these dams could be replenished in time of need? I doubt if there is any. There are some natural creeks where the Macquarie breaks out which might be used in that way, but it is doubtful if a channel could be made to carry the water across to the Bogan so as to be of any service. I think the natural run of water in the Bogan is sufficient for the dams, using it for stock only.

Storage.

7912. But do you not think the natural run in the Bogan and the loss of water in flood-time would allow you to store enough for irrigation purposes? Certainly not.

Irrigation.

7913. Do you think that if irrigation were attempted on any scale, water would have to be conserved at the head of the river for the purpose? I do not know the head of the Macquarie; at the head of the Bogan it could not.

Storage.

7914. If water were conserved at the head of the Macquarie, where natural facilities offer themselves, do you think that water could be diverted into the Bogan, if necessary? It would be impossible for me to say. I do not think any dam could be made at the head of the Macquarie to irrigate this country for any time.

7915. In speaking of "this country," do you mean the whole country? The country about the Bogan.

7916. Just in the vicinity of the river? Yes. I doubt if there would be enough for that, but not knowing the head of the Macquarie I could not say, though I should doubt it very much.

Diversion.

7917. Do you think that if the water could be diverted by means of a canal between the Macquarie and the Bogan it would be of service in replenishing dams, or be used for irrigation purposes on any scale at all? It is possible, if there was a sufficient flood of water. Speaking of the dams on the Bogan, I should like to

Nyngan dam

mention that the dam at Nyngan has been made in exact opposition to what I have pointed out as necessary. The surface of the earth has been cut away—a thing no practical man would do—and the dam has a steep fall into the river at the back, so nothing is more certain than that the dam must go at the first flood.

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7918. By whom was it constructed? It was constructed by the Government. It is in a very bad place. It should have been about a mile below where there is a good natural get-away, and where I am certain that a dam which would stand fourteen or fifteen years could be made.

7919. But the dam having been made where it is, do you know of any means which could be adopted to preserve it? The only way I can possibly think of is that the channel should be stopped down there altogether, and be diverted and brought through culverts about half-way between the township and the river. That is the only possible chance of saving it, in my opinion. But by far the best plan would be to make a dam about a mile further down, where the natural get-away is.

7920. What height is this dam? I have no idea; it backs the water a distance of 5 or 6 miles. Back-water.

7921. Is there a good depth of water? 15 or 16 feet. Depth.

7922. Do you water the stock on your station principally from dams, tanks, or wells? Dams and tanks.

7923. Have you attempted to sink many wells? I have sunk one on the West Bogan about 240 feet deep, and I got brackish water suitable for stock, but entirely unsuitable for drinking. Wells. Quality of water.

7924. Did you try to sink lower? No; the water came in too fast. It rose 100 feet in the well in about a quarter of an hour. Rises.

7925. What is the size of the well? 6 feet by 4 feet. Size.

7926. Have you tried any other wells? I have tried on the East Bogan, and have invariably found salt water. Salt water.

7927. Have you tried on the East Bogan to go lower and get fresh water? Never.

7928. What strata do you sink through? Clay; occasionally coming upon small pebbles and gravel. Strata.

7929. What would you take the pebbles and gravel to be? Water-worn.

7930. Then, for practical purposes, sinking wells in this country has been a failure? Quite a failure, as far as my experience goes. I have got wells in sand drift within about 25 feet of the surface, but they invariably go dry after a little while. Supply.

7931. Have you any tanks back from the river on any creeks? I have tanks all over the creeks, usually in catchments; I have dams on the creek back from the Bogan. Tanks.

7932. Have you no difficulty in storing water there? No, there is plenty of water for stock.

7933. Have the seasons during the last year or two been very severe here? For the past four years they have been excessively severe. Seasons.

7934. Have you any idea of the proportion of stock which has been lost? It is very difficult to say; there have been losses every year. Loss of stock.

7935. Do you think the loss has been 50 per cent.? Quite that, I should think; for the past two years there has been no lambing here at all.

7936. Has that loss been wholly attributable to the want of feed? Entirely; I was never short of water. Want of feed.

7937. Could the loss have been prevented, to a certain extent, if water had been distributed more plentifully over the properties? I do not think it would have made the least difference—I had it well distributed.

7938. Do you think that if during these seasons you had had water for irrigation you could have grown any large quantity of fodder? I do not think so. Irrigation.

7939. Have you attempted irrigation at all? No, except in my garden by means of a windmill.

7940. With what result? The result was that the windmill could not keep the garden going. The wind was sufficient to keep the windmill going. Result.

7941. Then you had not the means of raising sufficient water for supplying the garden? No. The windmill was an ordinary Californian windmill. Windmill.

7942. What was the area of the garden? About half an acre. The ground used to crack, and through the cracks the water would run for three-quarters of an hour in a good stream. Area of garden

7943. Were you unable to grow vegetables? Yes, I had to give it up.

7944. Do you know of any instance where irrigation on a small scale has been attempted? No, I do not.

7945. With good seasons, does the soil appear to be rich and prolific? Yes. Soil.

7946. Have you attempted in any way to store hay from natural grasses? Not this year; this is the only year there has been a chance of doing it. Storage of hay.

7947. Do you think it could be done to any extent? It might be done, if it could be done to a sufficient extent to keep a number of stock.

7948. Have you ever had any experience as to what quantity of hay would keep sheep? No, I have not had any personal experience.

7949. Have you any idea? No; it would be too much like a guess.

7950. Do you know what the cost of collecting bush hay is? I have heard, but I do not know from personal experience.

7951. Do you know what is the cost of growing artificial hay? No, I have never grown hay.

7952. Have you had any experience of evaporation? No, not scientifically in any way. Evaporation.

7953. But practically? Practically I have, but I cannot give you any figures.

7954. What observations have you made? I am afraid I cannot give you any actual instances in which I have noticed it for any length of time.

7955. Have you not noticed the apparent evaporation from tanks and wells? Yes, but I have not noticed it for any length of time. I did keep a record once on a station near Cobar of the way the water in the tanks went down every week, and we reckoned that the evaporation in the middle of the summer during the hot winds was about 4 inches a week.

7956. That would be 8 feet during the summer months? Yes; of course in the winter-time there was no evaporation to speak of.

7957. Do you think the country is of such a nature that if it were well supplied with water it would be capable of carrying a considerable population? The soil is good. Population.

7958. It would be entirely a question of water supply? Yes; there are some places where the soil is very barren and rotten, but on the other side of the Bogan it is good enough for anything. Water supply.

7959. Which do you consider the best soil in the district for cultivation? The red loamy soil. Soil.

7960. Is most of the East Bogan soil black soil? Yes; I do not think it is capable of growing good crops.

7961. Will you describe the difference in the timber on the East and West Bogan? The timber is not very different; there is not so much myall on the West Bogan; there is myall 20 miles up from here. Taking it upon the whole, there is not a very great deal of difference, but the timber is very much thicker on the West Bogan. Timber.

Mr. W. Allison. 28 May, 1885.

7962. Is there a marked division in the country made by the river? Yes, very marked, 5 or 10 miles from Nyngan.

7963. *Mr. Gipps.*] Do cray-fish or vermin of any kind affect the dams at all? I have not found them to affect mine.

Cray-fish.

7964. Have you heard of any instances in which they have? I have heard of instances of their making holes through the dams, but I have never seen any.

Mr. Alfred Chapman called in and examined :—

Mr. A. Chapman. 28 May, 1885.

7965. *President.*] Do you live in this district? I am living here just now, near Nyngan.

7966. Do you know the district pretty well? Not very well.

7967. Which part of the country do you know best? The country about the Macquarie.

7968. How far from here? 75 miles; about 15 miles above Warren.

Creeks.

7969. At or near the point where you live are there any watercourses breaking out from the Macquarie which carry water in flood-times? Yes; there are the Ging Ging, the Bauban, the Beleringa, and the Gunningba Creeks.

Direction.

7970. In which direction do those creeks run from the Macquarie? When they leave the Macquarie they are running towards the Bogan.

Flood.

7971. At what stage of the height of the river does the water flow into these creeks? It breaks over the banks.

7972. Would that be at an ordinary or at a high flood? At a high flood.

Waterholes.

7973. Do the creeks become dry? There are waterholes in them.

7974. Natural or artificial? Natural.

7975. Do they never become dry? Not that I have seen.

Weir.

7976. Do you think that by placing a weir across the Macquarie below the off-take of these creeks a supply of water could be diverted in ordinary floods? I think so.

7977. Without injury to the property-holders below? I think so.

7978. Would that give permanent water at all times in those creeks? Of course it would not keep them running.

7979. But would it make the numerous waterholes permanent? I think so.

Nature of country.

7980. What is the nature of the country about there? Plains—myall and salt-bush.

Soil.

7981. What is the soil like—is it soft? It is rather soft.

7982. Is it not a hard red clay? No; it is all made soil—made by the overflow of the rivers.

Irrigation.

7983. Have you ever had any experience of irrigation on a small scale? I have never seen it tried but once; that was in the Riverina, on M'Caughey's station.

7984. Was it carried out there on a fairly large scale? No, it was done simply to irrigate a horse-paddock.

7985. Was it successful? No.

7986. How long ago is it since you were there? Seven years.

7987. Are you not aware that Mr. M'Caughey has improved his irrigation since then? I have been there since. He is now bringing the water from the creek on the opposite side, to irrigate the gardens and grounds about the house.

7988. Do you know whether he irrigated any agricultural land last year? I do not know.

7989. You do not know that he irrigated a paddock of hay, and got 2 tons of hay to the acre, when his neighbours did not get any? I can quite understand that.

Macquarie flood-waters.

7990. Where does the water flow to when it breaks out of the Macquarie as you have described? It goes down the Beleringa and Gunningba Creeks, and runs in a direction north-west towards the Darling.

Country.

7991. Is the country sufficiently flat between the Macquarie, the Bogan, and the Darling to conduct water over it, if there were a sufficient supply? Yes.

Wells.

7992. Have you had any experience of well-sinking? Yes, we have put down eight different shafts on the Macquarie at Mullah, and we got water in two of them, at a depth in one of 140 feet, and in the other at 85 feet.

Quality. Supply.

7993. Was the water good? Yes; there was not a very great supply in either. The water in the 140 feet well was not sufficient to water stock, and we went on with the shaft to a depth of 350 feet without getting any water, and then we put a bore in for about 120 feet, sinking the total distance 470 feet, and still we got no water.

7994. Did you never sink it further? No.

Strata.

7995. What did you come to? A kind of hard cement.

Drift.

7996. Did you go through any drift? Yes, but there was no water in it. We found that kind of cement at the place where we tapped the water in the first instance. The water fizzed out something like water fizzing out of a bottle of soda-water.

Cost.

7997. *Mr. Gipps.*] What did the sinking of the well cost? I think for 220 feet we paid £1 a foot.

7998. And for the boring? I could hardly tell you—we had men employed by the week. We used an ordinary Tiffin auger.

7999. *President.*] Can you not give any idea of the cost of the boring? No, I can hardly tell.

Work per day.

8000. What distance a day did the men go? During the first part of the work 5 or 6 feet a day, afterwards less. We had great difficulty in boring, because the auger kept continually breaking.

8001. Did the boring cost more than the sinking? No, not so much.

8002. Even though it was at such a great depth? Yes.

Other wells.

8003. What other wells have you? We have put down five other wells, averaging from 80 to 120 feet. In one we got water, but it was very salt; in the others we got no water at all.

Supply.

8004. Did you not get a successful well? Yes, one at 85 feet. It watered 2,000 or 3,000 sheep. It was not very good water. We found it in drift; it rose in the shaft about 20 feet. The well was about 18 miles out from the river.

Source.

8005. Have you any idea as to where the source of the water is? I think it is in the bed of an old river.

Strata.

8006. What did you pass through? Clay and a kind of cement.

8007. Do you think you would be likely to succeed in getting an underground supply of water in that country if you sank deep enough? I do not think so. Mr. A. Chapman.
8008. For what reason did you abandon the shaft at 120 and 130 feet? We did not think we could get any water, after going on with the others to so great a depth. 28 May, 1885.
8009. Were they near the others? A few miles away.
8010. Do you know anything of the Macquarie Marshes? Not very much.
8011. Do you think all the creeks and rivers in this part of the country could be easily dammed across? I doubt if the Macquarie could be easily dammed, because the soil of the banks is of such a nature that it would be difficult to put up a dam which would hold; it is an alluvial black soil, which seems to melt with the water. Damming of rivers.
8012. Do you think that masonry overshot dams would be successful? I do not fancy so. Overshot dams.
8013. Have you any idea as to the best mode of storing water in any of these creeks? No, I have had no experience except of ordinary earthen dams.
8014. And these you think would not answer on the Macquarie? No, I do not think they would.
8015. Are there any natural bars across the Macquarie which would form foundations for dams? Yes, two or three. Bars.
8016. Is not the Macquarie dammed at any place? Not that I know of; there is a place near Narromine where the soil is a sort of conglomerate of clay. Dam at Narromine.
8017. Would that prevent the water from soaking through? Yes.
8018. Does that dam back a good deal of water? Yes.
8019. Does it rise near the surface on the banks, or does it simply crop out on the bottom of the river? It is about half-way up the banks.
8020. Then if an overshot dam were placed across the river, even going as high as this bar goes, would it raise the water in the river considerably? It would raise it some 6 feet. In connection with the putting of the water into the back country between the Macquarie and the Bogan, my idea all through has been that the best place is at Narromine—I think the river should be locked there. There is a cowal running through there into the back country, and it may be possible to put the water down that. It would water a large extent of country lying between the Bogan and the Macquarie. Cowal.
8021. Or it could be brought by a canal if a canal were constructed? Yes.
8022. And if water were taken from the river at that point, would it water a large area of what is at present dry country? Yes, it would.
8023. And good country? Yes.

Mr. Augustus Lyne called in and examined:—

8024. *President.*] You have resided at Nyngan for some years? About four years. Mr. A. Lyne.
8025. Have you seen the Bogan River in flood? No.
8026. Have you taken any notice of the dam across the Bogan at Nyngan? I have. 28 May, 1885.
8027. What is your opinion of it? I have never seen a flood here, but I believe that the dam will go the first flood we have. I have seen a little fresh that has passed over the by-wash and carried a great deal of it away. Dam at Nyngan.
8028. In the event of that dam going, would it leave the township of Nyngan without water? It would.
8029. Do you think there is an urgent necessity to put another dam below it or to repair it so that it will stand? No.
8030. Do you not think it is possible to repair it so that it will stand? I do not think so.
8031. Does it back any quantity of water at the present time? Yes, a great deal.
8032. And that water is permanent? Yes.
8033. Have you had any experience of irrigation here on a small scale? Yes; in a garden, by pumping water from the river by means of a windmill. The patch of ground was very small. Irrigation.
8034. And has the result been beneficial? Yes.
8035. And at times when the rest of the country is bare you are able to grow all kinds of vegetables? Yes, anything.
8036. Do you find grapes grow well here? Very well.
8037. Do you think irrigating the soil would produce vineyards to any extent? Yes. Vineyards.
8038. Do you think from your knowledge of this district that there is a sufficiently large extent of soil here to carry a considerable population if there were water to irrigate it? With water anything could be grown. Population.
8039. Do you think it would be desirable to create Water Trusts to conserve water all along the creeks, or should the matter be left to the Government to deal with? I think it would be better to leave the matter in the hands of the Government. Water Trusts.
8040. Why? Local Boards are very good, but they generally disagree, and on the whole I think it would be better to leave it to the Government.
8041. Would the people availing themselves of the water pay a rate to the Government? I fancy they would. Water rate.
8042. *Mr. Gipps.*] Do you not think a water supply for the town might be obtained from wells? I am sure it could not. Several wells have been sunk in the town, but the water obtained has always been salt. 250 feet is the depth of the lowest bore that has been put down close to Nyngan. Town supply. Wells.
8043. Have they bottomed on rock? No.
8044. What is the character of the strata? First, clay for 20 feet, then drift sand and layers of clay and drift sand. Strata.
8045. At what depth did they obtain the salt water? First at 75 feet. Depth.
8046. And it was not in sufficient quantities to prevent them from sinking further? No.
8047. Did they ever try boring? Yes, they bored the whole distance. Boring.
8048. And the sand was the cause of their not getting on faster with the work, and it eventually stopped them without their bottoming on any rock? Yes, without bottoming on any rock.
8049. Have they tried any wells near the river? One well was sunk in another part of the town, and a large supply of salt water was obtained. I sank a well close to the old bed of the river, and at 65 feet got fresh water, but not a large supply. Salt and fresh water.

FRIDAY,

FRIDAY, 29 MAY, 1885.

At Dubbo.

Present:—

MR. GIPPS, C.E., | MR. MURRAY, M.P.,
MR. LYNE, M.P., | MR. M'MORDIE, M.I.C.E.,
MR. TARGETT, M.P.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. William O'Neill called in and examined :—

Mr. W. O'Neill. 29 May, 1885.

8050. *President.*] Where do you reside? At Narramine.

8051. Have you resided there any length of time? About seven years, and on the Macquarie River over twenty-two years.

Floods. 8052. During that time have you seen any large floods in the Macquarie? Yes. In 1879 the water rose to within 4 feet of the top of the bank of the river. I have seen three floods—one in '66, one in '70, and one in '79.

8053. Did any of those floods overflow the banks of the river? Yes, to a considerable extent from Narramine down.

8054. Not above Narramine? Only just a short distance back.

Silt. 8055. Was the water at the time of flood very muddy? Yes, very muddy; in fact, the last flood left 4 inches of silt on the ground which it covered.

8056. Was that in the current or the back-water? In the back-water.

Dams. 8057. There are no dams across the Macquarie, are there? No.

Overflow. 8058. Have you ever seen the river overflow its banks anywhere near Narramine and the water run off in the direction of the Bogan? Yes; at Narramine, just about where I live. In 1866 I happened to be in Dubbo, and I was blocked by the flood until the river went down. When I went down the river I saw traces where the water had gone into Backwater Cowl and flowed away westward towards Dandaloo, on the Bogan; it also ran down towards Trangie, Timberabungie, and Buddah Lake.

Cowl. 8059. Was there any stream of water apparently flowing down the Cowl to Dandaloo? Yes, I believe the Cowl was full.

Size. 8060. About what size is the Cowl? I think about 100 feet across below Backwater; it is about 6 feet deep—in some places 12 feet.

8061. Would this Cowl afford great facilities for the storage of water in time of flood? Not below Backwater—it is too shallow.

Diversion from Macquarie. 8062. Do you think any means could be adopted to divert any portion of the Macquarie water by means of dams anywhere about Narramine? Yes. I may state that some time ago Mr. Cass asked me to supply him with information about the district as to its suitability for water conservation, and I wrote him a letter, which I believe he did me the honor to hand to the Commission. Subsequently, Mr. M'Kinney visited me at Narramine, and I took him to Rocky Point, on the Macquarie River, and also up the river

Old river bed. to Narramine, to what I call the Narramine Lake—a considerable depression which I think is the old bed of the Macquarie River. I produce a sketch of the Macquarie River from where Brummagem Creek goes

Rocky shelf. into it from the south side. Just below the junction of the river there is a rocky shelf, as shown on the sketch, consisting of hard granite.

8063. Does that extend across the river? No; it appears to me that the water has at one time run over that and made a cataract of it, but it has continually washed on to the north bank until it made a depression like that shown on the sketch produced, and marked A. There is about 10 feet of water in that, and the rock appears to shelve in right across the river. I measured the level of the top of the bar from the water and found it to be 18 feet. It is 3 chains across that rocky shelf to the south bank. What I would

Dam. suggest to the Commission is the erection of a dam on that rocky shelf.

Height. 8064. To what height? It will require to be 12 feet above the rock; that will give 30 feet above the present water-level.

Depth of water. 8065. If it were at that height, what would be the effect on the water above the dam? There would be 30 feet of water above.

Banks. 8066. Would that go out beyond the banks of the river? It would not flow out of the river; the banks are 53 feet high.

8067. Are the banks higher than the country a little way away from them? No, they are 3 or 4 feet lower than the country about where the water has never been known to flow. In 1879 the flood-water was 2 or 3 feet over the bank of the river at the place where I propose that the dam should be put.

Back water. 8068. If this dam which you suggest were made, would it back water up to such an extent that by a cutting it could be led out of the river above? Yes.

Diversion. 8069. And if that dam were made, at what point above could the water be diverted out of the river bed,

Cutting. and by what means? By means of a cutting (as shown on the sketch) from Brummogem Creek to Euromadan Lagoon; that would be a distance of about 250 yards.

8070. If water were conveyed into this lagoon, would it find its way back into the river unless stopped? What I propose is that the cuttings should be continued through the lagoon into Narramine Lake, a distance of about 3 miles.

Depth. 8071. What depth of cutting would there be in that 3 miles? It would average 9 or 10 feet.

8072. Is it country that could be easily excavated? Yes, it is all clay.

Narramine Lake. 8073. When the water got into Narramine Lake would you propose to dam that lake? I should propose to put a dam about 3½ miles from the top where the water comes in to the lake. The estimated capacity would be 4,500,000,000 gallons of water. If this suggestion of mine were carried out I estimate that the

Capacity. capacity of Narramine Lake would be about 4,500,000,000 gallons, while the quantity of water stored in the river above the dam would be 2⅓ billions above the weir; in Backwater Cowl ⅓ of a million between the upper and lower dams in the Cowl, and in what I call the crescent depression there would be 1,600,000,000 gallons more stored, making a total of 8,909,000,000 gallons of water.

Elevation. 8074. If this water were stored, would it be at a sufficient elevation to command the country lower down? Yes, it would flow by gravitation on to adjacent Crown Lands. I would also suggest the erection of a lower

dam

dam in Backwater Cowl, a mile from the first one, so as to drain water out of the crescent depression, and also that a cutting should be made above the first dam to let the water into the crescent depression, and a cutting made out of the crescent depression into the Backwater Cowl above the second dam, which would make an outlet to preserve the first dam and give a means of filling the Cowl between the two dams.

8075. Could not a succession of dams be made down the Cowl? Yes, a succession of dams could be made down the Cowl 3 or 4 miles further, securing at least 10 or 12 feet more water for 3 or 4 miles further down the Cowl. Succession of dams.

8076. And the whole of that water would be at such an elevation that it would command the plains country lower down? It would command the whole of the country lower down. Elevation.

8077. You have made an estimate of the cost of the whole of this work as described, providing for a concrete dam across the river, and the estimate you make is based on the prices now paid by squatters for similar work? Yes. For the price of the concrete per yard I am indebted to Mr. Moffatt of this town. Cost.

8078. And you make the total cost of the work suggested to be £24,350? Yes; a wooden weir on top of river dam 10 or 12 feet high would cost for 200 feet wide about £2,000 more.

8079. *Mr. M'Mordie.*] What is the concrete estimated at? £2 10s. per cubic yard; there are 4,003 yards. In addition to the concrete dam, I would suggest that there should be a wooden weir on top of the dam, with the piles set in the concrete. Wooden weir.

8080. Would it be permanent or movable? I have not attempted to give any opinion as to how it ought to be done, but it is necessary that there should be a movable weir on top of the concrete dam to regulate the flow of water down stream. The quantity of water estimated is not the quantity which would be dammed up by the concrete dam, but the other dam or weir on top of it. The water which would give the supply to the Narramine Lake and the other depressions would all be stored above the level of the concrete about 10 feet; that would contain an area of water 400 feet wide 10 feet deep and 15 miles long; the body of water below the top of concrete level is not calculated in my estimate of capacity.

8081. Do you think that if such a work as you propose were carried out, it would silt much from the stuff which comes down in flood-time? That is a matter upon which I would not like to offer an opinion, because we have no evidence anywhere to show that dams will silt up. Silting.

8082. But you have said that in one flood you noticed silt 4 inches thick on the land which had been covered by water? Yes, that was the sediment in the back-water or still water.

8083. *Mr. Gipps.*] Was that the result of one flood? Yes.

8084. How long did that flood last? I suppose not more than about five days.

8085. *President.*] Was that the back-water? Yes.

8086. *Mr. Targett.*] What was the nature of the silt? Fine sand; you may say mud.

8087. Would it damage pastoral or agricultural land? I should rather think it would improve it.

8088. *President.*] Do you think that the same thing as you suggest could be carried out at various points along the Macquarie? The Macquarie River dammed at intervals of 10 miles above and below Narramine on the rocky bars would hold enough water to irrigate some hundreds of thousands of acres, the greater portion of which could flow on to Crown Lands on either side of the western railway line from Narramine to Nyngan. Damming of the Macquarie.

8089. And by weiring the river down there, throwing a dam across, the same result as you have shown in your sketch would take place? Yes.

8090. Have you noticed any loss of water from the Macquarie channel at Narramine? No; it all goes back again; the ground seems to be very firm in that neighbourhood; there is, however, about 8,000,000 gallons loss daily below Rocky Point, which seems to be checked by the rock bars and sent towards Coonamble in the vicinity of the Monkey Scrub. Loss of water.

8091. And you think there is no loss from soakage? I do not think there is any soakage, except in respect to what I have stated.

8092. Have you a well at Narramine, a little way from the river? Yes. Well at Narramine.

8093. What depth is it? It is about 80 feet deep, and about 4 or 5 chains from the river. Depth.

8094. What did you sink through in getting water? The first 35 feet seemed to consist of layers of silt and mud, which had hardened into a red stiff clay, and after that layers of sand and gravel for about 35 or 40 feet more until the water was reached. I think it is nearly 40 feet below the river water at summer level. Strata.

8095. Do you think that what you passed through was deposit from the overflow of the river at various times? It looked like it.

8096. And is the water in the well river water? No, it has no local connection with it. Source of water.

8097. And where do you imagine is the source of the supply? I think it is about Dubbo. I think it must come from near Dubbo, from the river strata or tertiary drift.

8098. Have you ever noticed that when the Macquarie comes down in a flood the water in your well is affected? No, it is not affected; but during the rains they had in Dubbo last summer and recently it was affected.

8099. But not by the rise and fall of the river? No.

8100. Then from that you would deduce that the watershed is somewhere about Dubbo, but is not the river? It is not the river down there, certainly.

8101. Did the water rise much in the well after the rain? Yes, it rose 2 feet during the wet season in Dubbo last year. Rise.

8102. You have another well? Yes, half a mile away from the last—further out from the river. Other well.

8103. What did you sink through there? Drift somewhat similar to the material in the well near the river; it appears to be the same layer of water. Strata.

8104. And at what depth? About 90 feet. Depth.

8105. Did you get a good supply of water? No, I only went about 3 feet in; it still keeps at the same. Supply.

8106. Is that well affected in the same manner as the other well by rains at Dubbo? I do not think so; I hardly know where the water comes from in that drift; it may come from further south or from the direction of Harvey's Range. Source.

8107. But do you think it has any connection with the river? Not down there.

8108. Have you a good supply of water in the well first described? Yes, and the water is good in both wells. Quality.

8109. Have you tried cultivation at all? Yes. Cultivation.

Mr. W. O'Neill. 29 May, 1885.

8110. To what extent? I have about 60 or 70 acres under cultivation.
8111. Do you usually get a good crop? Pretty fair.
8112. Have you suffered from the dry seasons? Well, I could always grow a ton of hay to the acre at Narramine.
8113. Did you ever try the effect of irrigation? No.

Soil.

8114. Is the soil good in your neighbourhood? Very good—good enough to grow anything.

Population.

8115. If there was sufficient water for irrigation purposes, do you think the soil is capable of carrying a considerable population? Yes, I do.
8116. Have you ever tried to raise water by means of a windmill? No, the water is too low in my wells.

Sheep feeding.

8117. Have you ever fed sheep on hay? I have fed them on straw, not on hay.
8118. And you have no idea what quantity of hay it takes to support a sheep? Last year I bought a considerable amount of straw and gave it to the sheep. I allowanced them to 6 ounces a day on the average; some ate more and some less.
8119. Was that all the food they had? That is all except what little leaves and scrub they could pick up. With 6 ounces of straw and 2 ounces of green feed, sheep would live through our droughts if not too heavily stocked.
8120. Did that keep them in fair condition? No, the feed was too dry; I find that dry feed does not do for sheep.

Trusts.

8121. Do you think that such a scheme as you have suggested or sketched would be better carried out by Water Trusts, the people doing the work themselves and borrowing the money from the Government, or that the Government should undertake the work. I think that the Government would carry out the work better themselves; they have a better command of professional men; the sale of the land would pay more than the cost twice over.

Repayment of loan.

8122. How would you suggest that the Government should be repaid? The quantity of water proposed to be conserved I estimate would irrigate about 20,000 acres, giving the water at the rate of 3 inches seven times in the year. The whole of the land included in this area of 20,000 acres is good, and may or may not be open to selection when the runs are divided. I would suggest to the Commission that they should lose no time in getting it reserved from sale.
8123. But the question I asked is, how should the Government be repaid—by the sale of the land, and supply the water for nothing? No; the Government could complete the works, and the sale of the land would more than repay the cost of them twice over.

Water rate.

8124. And after that not charge any rate? Yes, charge a rate commensurate with a fair interest on the outlay.
8125. Do you think that the people who would use the water would be prepared to pay a fair sum for such water as they used? I am certain of it.
8126. How much do you think they would pay per acre? I would be glad to pay £1 an acre if I could get 3 inches of water three or four times a year on my land with our present rainfall.
8127. The land which would be irrigated adjoins the railway between Dubbo and Nevertire? Yes.

Settlement.

8128. Do you think that if the scheme which you propose were carried out it would induce settlement? Yes, I imagine it would very rapidly.

Evaporation.

8129. Have you had any experience of the evaporation from the surface of water? I have noticed that the evaporation in the locality I referred to is very little. Last summer in the midst of the drought I had a 2,000-yard tank in the cowl named. There were 1,500 sheep drinking water out of it all the time, and the loss by evaporation, drinking, and everything only amounted to 15 inches all last summer. There was no rain for about four months.
8130. What surface of water was there in the tank? 9 feet deep; I forget the width across. There was very little surface area; I think it was about 50 feet across—may be 100 feet.

Objections to works.

8131. If water were stored in the way you suggest, do you think the people further down the river would object to such a work being undertaken? The weir I propose on top of the concrete dam would regulate the flow of water so that it would make no difference to them as far as flood-waters were concerned or otherwise.
8132. Would any of the floods you have mentioned fill that depression? Yes; we have several freshes in winter-time, any one of which would fill it in thirty-six hours.

Soil.

8133. What kind of land is it which would be irrigated? It is alluvial soil—principally red chocolate soil.

Granite.

8134. Is there any other granite country near except this? There are granite rocks projecting out of the river side. The bar I have mentioned is the best site I know of.
8135. But the granite does not come to the surface of the soil? It rises above the surface to a considerable distance, but shelves off again.
8136. But away from the river? Below Narramine it is, as you may say, at the foot of the hills. Below Narramine there is very little rock of any kind.

Rainfall.

8137. What is the annual rainfall at Narramine? Last year I think it was 12 inches; I believe the average is 15 or 16 inches; it is only within the last three or four years that we have been taking any observations of rainfall at all.

Silt.

8138. *Mr. Murray.*] Do you think that much silting would take place in the Narramine Lake or in any other excavations made? I do not think so.

Building material.

8139. Is there good stone in the vicinity of the works proposed? It is all hard granite, and there is any quantity of river shingle for concrete purposes close by.
8140. Is there any stone but granite in the vicinity? I think there is; there is a kind of slate half a mile from there.

Loss of stock.

8141. Has the loss of stock been very great during the last four or five years? Yes.
8142. Do you think that a system of water conservation would have saved a great deal of that stock? Yes, because it would have enabled the stockowners to obtain some green feed; it is the constant dry pasture which kills most of the sheep, such as leaves, scrub, and dry stubble grass.
8143. Do you think that the pastoral tenants would avail themselves of the water supply for grass purposes? I do not think so; it would pay better to cultivate.

Artificial feed.

8144. And supply the stock with artificial feed? Yes.

Water rate.

8145. In cases where the land is alienated from the Crown, do you think that the owners would be satisfied to pay a fair water rate? Yes, I think so.

8146.

8146. And your impression, judging from what we have heard from you, is that water conservation would increase the prosperity of this district very much? Yes; I consider that if those works were completed you could establish 500 families on the locality I refer to, on from 10 to 40 acres of land each. Mr. W. O'Neill. 29 May, 1885.

8147. How much would the 20,000 acres you speak of be enhanced in value if made available for cultivation by a supply of water? If it was cut up into 10, 20, 30, and 40-acre blocks it would realize £5 and £6 per acre readily. Value of land.

8148. Then you think that 40 acres irrigated would support a family, and be worth as much as 2,000 acres are now? Yes, much more so.

8149. And you think it would be better for the Government to reserve the land and get the enhanced value after the water was laid on, than to sell it first and put on a water rate afterwards? They would have to provide water first before people would buy, but if there was water the Government could readily sell the land.

8150. What are the prevailing winds here in summer? Westerly. Winds.

8151. Are they continuous? Yes.

8152. Sufficient to allow the application of windmills to pumping? Yes, I think so, from shallow depths. Windmills.

Mr. Robert George Dalhunty called in and examined :—

8153. *President.*] Are you Inspector of Stock at Dubbo? Yes. Mr. R. G. Dalhunty. 29 May, 1885.

8154. Have you lived any time in this district? Yes, forty years.

8155. And you have had experience over the whole district? Yes.

8156. From the Castlereagh southward? Yes, I have been living at Dubbo the greater part of my life, but I have been all over the district, and all over the country pretty near.

8157. What is the nature of the country lying between the Castlereagh and the Bogan? Nearly all flat, black, porous plains. Parts of it between the Macquarie and the Bogan higher up are ridgy and consist of granite, but anywhere below Narromine the soil consists of black, porous plains, with belts of timber. Country.

8158. Is it level? Very level.

8159. And intersected by depressions and watercourses? Yes, cowls or gilgais as they call them. As you get lower down towards Warren there is almost a network of creeks overflowing from the Macquarie in times of flood. Cowls. Creeks.

8160. Is the Castlereagh a permanent river? No; but there is always a permanent supply of water in the sand a short distance down. The Castlereagh.

8161. But you have to sink in the sand for it? Yes.

8162. Are the floods heavy? Yes, I have seen very heavy floods. Floods.

8163. Do they cover any very large extent of country? Not very; they go out of the Castlereagh, but they do not go very far except in one or two places, where they fill the head of the Merri Merri Creek, and run for many miles through the back country. Merri Merri Creek.

8164. Do you know anything about the underground water westward from the Castlereagh? Yes, in what they call the Monkey, a bed of sand thickly timbered with pine scrub which extends for 50 or 60 miles, with an average width of half a mile. The Monkey.

8165. You can get water by sinking anywhere through it? Yes, at from 10 to 12 feet, and a good supply.

8166. But you do not know that it comes out of any river bed? No; I have an idea that it comes out of the Castlereagh near Coonambarabran, but you can see no signs of it there. Source.

8167. Your idea is that it goes underground and re-appears at the point named? Yes.

8168. *Mr. Targett.*] Is there any noticeable depression? Yes, in some places very marked. There are hard plains on each side, and it drops into white sand. In the middle of the sand bed there are large ridges in many places along the course of the sand. Depression.

8169. *President.*] But sinking anywhere you get water? Yes, according to the undulations of the surface.

8170. *Mr. Targett.*] Is there any noticeable current in the well? I think not; the water seems to come in all round the well. Current.

8171. *President.*] Is the water good? Yes; it is whitish, but it is very good. Quality of water.

8172. Does it rise in the wells at all? When first struck it rises 6 or 8 inches, but as you sink down it gets to a uniform level. Rise.

8173. Do you know of any other similar places in that country? I know of many places where the same water is got, in what they call Little Monkeys, which have no connection with the Big Monkey. There is a place called Back Tenandra, about 15 or 20 miles from Collie, a township on the Marthaguy Creek. Little Monkeys. Back Tenandra.

8174. Of what extent is that Monkey? About 4 or 5 miles long, and a quarter of a mile wide. There are innumerable wells there. In one drought there were fifty wells there, and half the stock of the country were camped round it. It is a totally dry country otherwise, but they got these wells, and there was plenty of grass. Wells.

8175. Has this Monkey any apparent connection with the large Monkey you have described? No, there does not appear to be any connection, but it is not far from it. Connection.

8176. Does it run in the same direction? Yes. Direction.

8177. Do you know of any others? The only other that I know of is the place between the Bogan and the Macquarie, and not very far from Nyngan. There were some wells sunk on a Monkey there, but they were much deeper, and the water was totally different, but it is the same sort of Monkey. Monkey near Nyngan.

8178. Do you know of any others? Down on Mr. Egan's run, below Mount Harris, on the east side of the Macquarie, there are some wells sunk in a Monkey. Near Mount Harris.

8179. Of a similar nature? Yes, and the same sort of water, and at about the same depth.

8180. Do you know of any others? No.

8181. Do you know of any places throughout your district where irrigation has been attempted at all? Yes; I saw it tried at Mr. Flood's, at Quambone, on the Merri Merri Creek. I saw about 40 acres of hay sown in the month of June, 1884, on poor soil, irrigated twice with a centrifugal pump; it yielded pretty nearly 5 tons to the acre. Irrigation. Yield.

8182. Whilst that was growing was there a bad season in the surrounding districts? Yes, and stock dying in all directions.

8183. How was the water distributed? The water was run first into galvanized iron troughs, then into drains about 3 feet wide and 8 inches deep. The drains ran all round the paddock, and there were cross-drains, and the water soaked from one drain into another. Distribution.

Mr. R. G. Dalhunty. 29 May, 1885.

Loss of stock. 8184. Do you know of any other instance? No, I never saw any other.
8185. During the time of the last few years of drought have you had serious losses of stock in your district? Yes, very heavy losses indeed.
8186. About what proportion do you suppose? I should think it must have been nearly 60 per cent.
8187. What did Mr. Flood use the hay for which he grew? He was breeding race-horses, and he used it for them.

Artificial fodder. 8188. Do you think that if the lessees as a rule adopted a system of agriculture and of irrigation they could grow any quantity of fodder to keep sheep alive during dry seasons? I think they could, but I do not think they would—it would not pay.
8189. But would they buy it if it were shown that it would prevent the losses that occur? No doubt they would use it largely for stud sheep or cattle. It would be a very poor thing to grow hay to feed some squatters' sheep, as some of them keep up to 180,000 sheep.

Cost. 8190. What do you estimate would be the cost of growing hay? The cost of growing it by ordinary means is about £1 per ton.
8191. And to that would have to be added the cost of water? Yes.

Natural depression. 8192. Do you know of any places in your district where large quantities of water could be conserved in natural depressions? No, I do not, except this back-water and the Buddah Lake, the place described by the previous witness (Mr. O'Neill), though he mentioned one place which I do not think much of—the Narramine Lake. Narramine Lake. I have seen it full of water one week, and only about 8 inches in it the next. The soil does not appear to hold—it is nearly always dry.

Damming of the Macquarie. 8193. Do you think it is possible to dam the Macquarie River at various points so as to conserve large quantities of water in the river bed? I think it would be a very expensive and very difficult undertaking, though I suppose it could be done.

Trusts. 8194. Do you think that works for the conservation of water should be carried out locally by Trusts created for the purpose, or by the Government? I think the Government would have to do it.
8195. And then charge a rate for the supply of water? My opinion is that it would be much better if it could be done by Trusts, but I am sure it never would be done.
8196. But if the Government were to carry out two or three schemes, to show that it could be done, do you think that then Trusts would be likely to take the matter up? They might; the people have been taught many things by Victorian enterprise, and I have no doubt that there would be plenty of money and enterprise if it were seen that it could be done.

Underground supply. 8197. Do you think that generally there is a plentiful supply of underground water over the lower parts of your district? I do not think so. I speak from experience of the wells which have been dug. People have gone enormous depths for water without obtaining it, and at other places have got a good supply at a comparatively shallow depth.

Narrow drifts. 8198. That would lead you to suppose that the water was running in narrow drifts? Yes, something of that sort I suppose.

Population. 8199. Do you think the country about here would carry a fair population if they could get water? I think so.

Creeks about Warren. 8200. *Mr. Targett.*] Do any of the creeks about Warren hold permanent water? Yes, nearly all the creeks below Warren hold very fairly, but the holes are not large enough; there is only one that is really permanent—that is the Bird's-nest hole.
8201. Are tube wells used in many parts of this district? No; there has been some boring done.

Loss of stock. 8202. *Mr. Murray.*] Do the stock die principally from want of water or want of grass? From want of grass; with water they might have lived a little longer. The grass is nearly always gone long before the water, except in some back places.

Artificial food. 8203. Do you not think that if they had had a partial supply of artificial food it would have saved them? It would have saved them.

Cost. 8204. You said you considered £1 a ton was the cost of producing hay? Yes, in ordinary seasons.
8205. And do you know how much hay a sheep eats per day? I do not.

Profit per sheep. 8206. Do you know the profits usually obtained from sheep in fair seasons? Yes; but I think the profits would be very small if the sheep were fed on hay. When they are fed on natural grasses the profit is from 3s. to 4s. a head. I think that in time of drought it would be quite sufficient if the sheep were saved without looking for any profit. If you have to feed a sheep on twice his value of hay it will not pay to keep him.
8207. The 3s. or 4s. profit you speak of is exclusive of the increase of the flocks? Yes.

Lucerne. 8208. *Mr. Targett.*] Good lucerne could be cultivated if the land were irrigated? On the river flats the benefit would be almost incalculable.

Price of sheep. 8209. *Mr. Murray.*] The average price of sheep is from 10s. to 15s., is it not? The average price is 10s.
8210. At what is considered sufficient to keep a sheep alive, you could keep about six sheep a year with a ton of hay: do you not think that would pay if you could produce hay at £1 per ton? I do not think you could produce it at £1 per ton, if you had to pay for water.
8211. *President.*] But would not the extra yield pay for the water? It might.
8212. *Mr. Gipps.*] What is the least quantity of hay you think a sheep could be kept on? I have not the least idea; I never saw a sheep fed on hay.

The Monkeys. 8213. Speaking of the Monkeys—do you sink through sandstone in them? In sand all the way.

Bottom. 8214. And do you bottom on rock? No, a sort of pipeclay. The water comes in from the sides, and wells up; and it maintains the same level, no matter how deep you sink.

Supply. 8215. Is the water sufficiently heavy to prevent your sinking? No; though there is plenty of water, thousands of sheep and cattle are watered there in times of drought.
8216. Does the quantity drawn from any well lower the surface? Yes, but only for a few minutes; it fills again almost immediately.
8217. *Mr. Targett.*] But you do not know that you would not get a larger supply if you went further? I do not think you would—I think you would lose it.

Mr. Craven Hyde Fitzhardinge called in and examined :—

Mr. C. H. Fitzhardinge.

29 May, 1885.

8218. *President.*] You are a solicitor? Yes.

8219. How long have you been here? Fourteen years—since 1872.

Floods.

8220. Have you seen many floods in the Macquarie? Yes. It is hard to define what a flood is in the Macquarie. I have seen many rises. We have had what we call floods—large floods—during that time.

8221. The rest have been rises? Yes; the water just coming over the banks. I had a photograph of one flood taken in 1879 (*Appendix* AA); it is the highest flood I have known, but I believe there was a flood 4 feet higher than that; it came up in Macquarie-street 18 inches higher.

Highest point.

8222. The photograph represents the flood at its highest point, and shows a view of the wooden bridge now across the river? Yes.

Current.

8223. *Mr. Targett.*] Is there a great current in the river at that height? No; the current leaves the river and goes nearer the town, over the flats which form the banks of the river. I have measured with a line from where the water has touched the top of the pier of the bridge in the flood photographed down to the present level, and I find it from 45 to 46 feet; the width would be from half a mile to three-quarters. The water rose one day and remained just over the banks, and was receding, when the Mudgee water came down, and the water rose again to height as shown in photograph. It remained up two days, when it fell to the level of banks, and rose again the following day just over the banks. This flood lasted four days.

Conservation.

The Talbragar.

8224. *President.*] Have you any knowledge of any point at which the Macquarie waters could be conserved on a large scale? I know several creeks. The Talbragar River would be a good place; it runs into the Macquarie about 4 miles above Dubbo. If it were dammed at the entrance it would throw the water back a long way. The banks are very steep, and the water would be conserved within the banks. The country is good holding ground. Then again, the Hyandra Creek, about 9 miles above Dubbo, on the Cainboogle Run, is a creek with very high banks in which water could be easily conserved and would be thrown back a long distance; but the land on either side is private land. Again, the Little River, about 14 miles by road, above Dubbo.

Hyandra Creek.

Little River.

Land.

8225. I suppose the land generally on the banks of the Macquarie from Dubbo upwards is private land? Mostly; some of it is reserved.

Dargindale.

8226. Are there any other places off the river wherein to conserve water? In the vicinity of Dubbo there are few; but about 50 miles down the river there is a place called Dargindale, on the Burraway Run; its extent is about 4 miles by 2. With a little expenditure I should say it could be made to conserve a large quantity of water. The depth is over my head, and the water could be artificially increased by means of a dam.

Lagoon.

8227. *Mr. Targett.*] What is the get-away—a creek? The water goes out over the country, and evaporates or is absorbed—it is a lagoon.

Euloon Cowl.

8228. *President.*] Are there any other places? Further down, about 15 miles, there is a place called the Euloon Cowl, which is supplied by the Macquarie River in very high floods. I have been on it in a canoe. It was fully 5 miles long, by 2 wide.

8229. And about what depth? I could not tell you. I should say that it was at least 14 or 15 feet deep.

Diversion.

8230. Could the water be diverted into that by any cutting from the river at a lower level? I do not think so—not where it comes in at present; but you might by striking the river higher up. The cutting would be very expensive and very long. The Cowl is about 4 miles from the river. What I should propose would be to dam the entrance to the Cowl so as to prevent the flood from running out after it had run in.

Macquarie banks.

8231. Do you think it would be dangerous to touch the banks of the Macquarie without using great care? Yes, for fear of its scouring. There are two places I may mention. In one the Municipality some years ago ran an ordinary 4 feet dam, and it is now an immense chasm. Again, the railway drain, which was originally 6 feet by 4 feet, has scoured to about 40 feet square.

Dams.

The Rocks.

8232. Do you know any parts on the Macquarie at which dams might be constructed with advantage? It is beyond my knowledge. There are places, but I do not know whether the dams would stand. There is a place at Burraway called the Rocks, 30 miles below Dubbo.

8233. Would a dam back the water a considerable distance? Yes; the banks are very high, and there is no great fall.

Dam at Browning's H

8234. Do you know of any points up the river? There is a place just about Dundulamil Station, and near Mr. E. H. Barton's farm; I think a dam could be made there with great advantage, near the foot of what is called Browning's Hill.

8235. Would a dam there cause the water to spread over a large part of the flats? Yes; it would spread until it reached the old original banks of the river on the opposite side.

At Old Dubbo.

Town supply.

8236. Do you know any other points? Up at Old Dubbo there is a place where you could get a rocky formation—a place where Mr. James, the engineer, has picked a site for the proposed water supply for Dubbo.

8237. Would that dam conserve a large quantity of water? Yes, a considerable quantity.

8238. Is it above or below the town? Above.

8239. Would it have a sufficient elevation to supply the town? Yes.

8240. *Mr. Gipps.*] By gravitation? Yes.

8241. *Mr. Targett.*] How far is it from Dubbo? Over 5 miles.

Quality of water.

Site for reservoir

8242. *President.*] That is as the crow flies? Yes. I do not think the water would be good enough for the town all the year round without filtration. I think there is a better site, and one handier to the town than that selected by Mr. James; it is on a hill overlooking the town. The formation there is sandstone, of which reservoirs could be made, and the cost of piping would be much less. It would be only a mile, or a mile and a half away, but on opposite side of the river from the town.

Percolation.

8243. Do you think there is much loss of water by percolation through the banks of the river? I know there is some, but I cannot say how much. I have noticed many times a strip of bank above the water line very wet and boggy, leading one to suppose that the water was percolating into the bed away from the river.

8244. If you see the banks soft and wet it would be an indication that the water was percolating? No; I should say it was soaking up by capillary attraction.

8245. You do not know from actual observation whether there is any great loss of water from one point to another on the river? No; I have noticed with astonishment the way the water goes, but I put it down to evaporation.

8246.

Mr. C. H. Fitzhardinge. 29 May, 1885.

8246. But it may be percolation? Yes; I have known the river to fall 4 inches in a day.

8247. That is from a low level? From a very low level indeed; in February, when the heat of the sun is very severe.

Irrigation.

8248. Have you had any experience of irrigation in a small way? Yes; I started irrigation about eighteen months ago, and raised certain crops with great success, although they were put in in a rough way and were left to take care of themselves. I raise the water by means of a Tangye pump. A wool-scouring establishment, in which I am interested, raises the water for wool-scouring, and after it had been used for that purpose I used it upon my ground and irrigated about 10 acres.

Crops. Barley yield.

8249. And what crops do you usually grow? First of all I grew Cape barley, of which I got an immense crop—so thick that the machines would not cut it. Then oats, then lucerne, and latterly, corn.

8250. How many tons of barley and oats to the acre were there? I had 2 acres of oats, and there were 14 tons of hay, estimated by farmers.

8251. That is 7 tons to the acre? Yes.

8252. And what was the weight of the barley? I could not give a fair estimate, because it could not be cut. It lay down, owing to the extreme growth. What I cut went, I should say, about 4 or 5 tons to the acre. The cornstalks grew about 16 feet.

8253. Have you any idea of the number of bushels to the acre? No; it has not been threshed yet.

Lucerne.

8254. How many crops of lucerne did you get from the irrigated land? I only got one, and that I fed down. It was an immense crop.

Windmills.

8255. Would it be possible to raise water by means of windmills for irrigation? Not unless you erected a reservoir and had a windmill to pump the water into it before you used it; you could not pump directly on to the land, to keep up a sufficient supply.

Reservoirs.

8256. Would it be possible to excavate banks so as to form reservoirs? Yes, if you raised them up so as to run the water off. A great many windmills are used for private gardens in Dubbo, and they answer very well. Flowers are produced very luxuriantly.

Extension of irrigation.

8257. Do you think that irrigation, if water were properly conserved, could be carried on on an extensive scale? I have no doubt it could.

Population.

8258. And if the country were irrigated would it carry a large population? There is no doubt about it.

Stock-feeding.

8259. You have had no experience in feeding stock with hay? No; but from inquiries I have made I have heard it would not pay to buy hay.

8260. Could you give any results of your observations as to evaporation? Not reliable information.

Water per acre.

8261. *Mr. Murray.*] Have you any idea of the quantity of water used per acre? No, I have not, because it is only waste water. While the machine is going the water is running. The pump throws 16,000 gallons an hour if required.

8262. How long is it working? It has been working for about six months, at eight hours a day.

Distribution.

8263. *President.*] How do you distribute the water? Through channels—one long one and several small ones.

8264. Is the large one at a slight elevation above the others? Yes.

8265. So that the water is raised above the ground adjoining? Yes.

8266. *Mr. Targett.*] At what intervals are your minor channels? About 10 feet, and about 6 inches wide.

Legislation.

8267. *Mr. Gipps.*] Do you think it advisable that future legislation on water conservation should provide that all the waters of the rivers, streams, and lakes, should be the amalgamated property of the State? Yes, decidedly. You were asking the last witness about the wind. I take the records for Mr. Russell. I find

Wind.

that the prevailing wind here in summer is south-west—that is the day wind. At night we generally get the wind from the north-east. That is a peculiarity noticed by Mr. Russell, for in Wellington and down the river they do not get the north-east winds.

8268. Are the winds regular and continuous? In summer the south-west wind is very continuous—it is a dry wind; as soon as it veers to the north-west we get rain.

8269. *President.*] Have you any instrument for testing the evaporation? No.

8270. There is an instrument in the town? Yes, kept by Mr. Jas. Heane, in charge of the Government machines for observing the weather.

Mr. John S. Brown called in and examined:—

Mr. J. S. Brown. 29 May, 1885.

8271. *President.*] You are a stock and station agent at Dubbo, and have resided in the district a great number of years? Yes, since 1863.

8272. And you have been here during some very high floods? Yes.

Floods.

8273. Is any large extent of country covered with floods back from the Macquarie? Yes, after it gets below Narromine.

8274. Do you know the nature of the Macquarie Valley, as to natural basins? Yes, I have travelled on each side of it for miles out.

Storage.

8275. Are there any natural basins up the course of the Macquarie above Dubbo where large quantities of water could be stored? Yes, I believe there are places where you could store large quantities of water.

8276. The country on each side of the river is high? Yes.

Flats.

8277. Are there large river flats? Not very large.

River-bed.

8278. Is the bed of the river large? Yes, it is wide, taking into consideration the size of the stream.

Places for dams.

8279. Are there any places where the hills come together at points opposite to each other, where dams could be thrown across? Above Wellington there are some fine places for storing enormous lakes of water.

Bars.

8280. Are there any bars of rock running across on which dams could be constructed? Yes, at numbers of places.

8281. Can you indicate any particular place? There is a place near the junction of the river with the Mucrawa, and above that for many miles there are numbers of places.

8282. Above that point are the natural places large enough to store large quantities of water? Yes, hundreds of feet in depth.

Loss of water.

8283. I suppose there is an immense loss of water in times of flood down this and other rivers that you know? Yes, enormous quantities.

8284. Do you think that if a large quantity of that water were impounded up the valley of the river it could be utilized for purposes of irrigation? Yes, for watering purposes, and perhaps to a certain extent irrigation might be carried out, but I think that the works for the storage of water above Wellington would be of a very gigantic description, because the mountains are very high; and if it were possible to throw enormous dams across from one mountain to another you would have enormous lakes with immense quantities of water, not only in the valley of the river itself, but also in the tributaries that come in on each side.

The Talbragar.

8285. Do you think any quantity of water could be stored along the valley of the Talbragar? I do not think so.

8286. Why? The ground is all of a sandstone formation, and I think the water would gradually percolate through.

Banks of Macquarie.

8287. But that is not the case on the banks of the Macquarie? No, because there is no sandstone in the Macquarie above Wellington.

8288. Is there sandstone below Wellington? Yes, a few miles below, commencing about Guerie.

8289. And all along the course of the river till you come to the plains you find these sandstone bars at various places? Yes.

Soil.

8290. I suppose the nature of the soil is such that it will grow anything as long as it is well watered? The soil will grow anything; all it wants is moisture.

8291. Do you know the country between Dubbo and the Macquarie Marshes? Yes, very well.

Creeks.

8292. Do you know a number of creeks that break off towards the Bogan? Yes.

Damming of the Macquarie.

8293. Do you think it will be practicable to dam the Macquarie down that part of the country and throw water along those creeks during the time of a fresh in the river? I do not think there would be any difficulty.

Off-takes.

8294. Would you suggest that that should be done in the natural bed of the creek as it is now, or would you deepen the off-takes from the river into those creeks? It would be better to deepen the off-takes from the river.

Scour.

8295. If the off-takes were deepened, would there be much scour? There would be scour.

8296. Do you think it could be prevented? I believe it could.

Protection of dams.

8297. In what way would you suggest? It might be done by means of timber—a floor of timber; but those are matters which are perhaps more in the province of an engineer. I know that on stations we protect dams with logs.

Wells.

8298. Do you know anything of the wells that have been sunk in this district? I know that a great many wells have been sunk.

Quality.

8299. And have they been successful in many instances? The wells about Dubbo all contain good water.

8300. Have you a well of your own? Yes, about 50 feet deep, with an excellent supply of good water, but it is affected by the river.

8301. Then it is river water? Yes, I think it is, because we sank into the old drift, the same that we now get in the river.

Windmill.

8302. Do you use a windmill pump to raise the water for irrigating your garden? Yes.

Wind-power.

8303. Do you find you have wind-power enough to raise all the water you require? Yes, with the size of pump that is used; but I could use three times the quantity of water if I had greater power to lift it. I question then, however, if my well would stand without being deepened.

8304. Is this a windy part of the country as a rule? Yes, very windy.

Direction of winds.

8305. There is always wind enough to drive a windmill? Almost always. I do not think it ever stood still for five days. We have wind in the evening if we have none in the day-time. In droughty weather the wind comes from the eastward, apparently; in the evening and during the day it blows a lot from the north-west.

8306. Do you know anything of the wells in the salt-bush country? Yes, I have seen a great many of them.

Good wells.

8307. Can you particularize any part of the country where good wells are to be found? I believe there is a very good well at Nevertire, which has been sunk by the Railway Department, but there are some that are very bad. Mr. Ryrie sank some wells, one about 380 feet deep, fifteen or sixteen years ago. The water was bad, and although the sheep drank it for some time, it was not suitable, and Mr. Ryrie discontinued the use of it. It was brackish to a certain extent, and very bitter. Then there were two or three wells that Mr. Brown sank at Cannonbar. The water in them was brackish. The Duck Creek water-holes are generally very large and deep, one 15 or 16 feet deep at Cannonbar, and nearly a mile long. It is well protected by trees, so that there is not much evaporation. Mr. Brown constructed a windmill, and sank a well in the bank of the creek some 10 or 12 feet from the water-hole. When he reached a point level with the water in the creek, and where he expected to find water, he found a clay formation in which there was no leakage from the creek at all, and he continued sinking until he got 2 feet below the level of the water in the creek, where he came upon white sand; a few inches further down he reached the water, which was as clear as possible, but as salt as the sea. The depth was about 12 feet from the surface. You could dip the briny water out of the well on the one hand, and you could dip the fresh water out of the Duck Creek on the other.

8308. Then that would indicate that there was a stratum between the well and the creek that prevented any leakage or any contact between the salt and the fresh water? Yes. Speaking of wells, I may also mention that on Beleringa there were two wells which Mr. Beard sank, and in which he found beautiful fresh water. The wells were sunk in Monkeys, that is, enormous cups filled with sand and having gum-trees growing on them. You sink into those cups and you find fresh water. They have clay bottoms, and you go through the sand to the clay. It is no use to go through the clay, because if you did you would very likely come upon salt water, but it is possible in some instances to pump those wells dry.

Wells in Monkeys.

Supply.

8309. You are speaking of local Monkeys? The station-holders have told me that the same thing occurs in the Big Monkey between the Castlereagh and the Macquarie—the wells there have also gone dry.

8310. What would you conclude from that—that there is a limited supply of water in that country? Yes, depending on the depth of the cups.

8311. You consider that there is a succession of cups in that sandy country? Yes, or bars may run across the Monkey in places.

8312. Do you know any instances of artesian water being found in the country this side of the Darling? No,

Mr. J. S. Brown. 29 May, 1885.

No, I do not know of any. I know of some very strong saline springs that when tapped come with a great rush, nearly rising to the surface. There was one on a barren plain at Brown's run out from Mudall. The rush of water was so great that the men could not get their tools out.

Boring. 8313. What was the best means you had for tapping the subterranean water—did you do it by an ordinary well or by means of tubing? By boring.

8314. Have you had any experience in boring for water? I have not.

8315. Do you think it better than sinking an open well? I think it is, because it seems to me that by boring you can test the country quicker; it is cheaper to bore than to sink I should fancy.

8316. And when water is found I suppose no person objects then to sink for it? No, I should think not.

Expense. 8317. The great expense in obtaining water arises from having to sink so many wells before water is found? Yes, you may sink a dozen wells before you find water.

Irrigation. 8318. Do you think that, if a large amount of water were conserved in the neighbourhood of the runs, the squatters would avail themselves of it to irrigate and grow produce to store for dry seasons? I think they would.

Water-rate. 8319. Do you think that the people, both squatters and selectors, would be willing to pay a reasonable sum for a good supply of water for both stock and irrigation purposes? I should think so. If I were one of them I should be inclined to do so.

8320. Do you think if that were done it would prevent the mortality that has occurred among stock during the last few years? I think, to a great extent, it would.

8321. Have you had any experience as to the quantity of hay necessary to keep sheep alive? No, I have not. I do not think it would take very much.

Water Trusts. 8322. Do you think it would be better in carrying out any works for water conservation that they should be done wholly and solely by the Government, or that there should be legislation to enable local Water Trusts to carry them out? That is a matter that requires some consideration. As to local Trusts, I am doubtful about them. I think it would be necessary for the Government to take the thing in hand, at the same time looking well ahead to the returns to come in from the outlay.

8323. Do you think that if the Government undertook some of the most favourable and most gigantic works to prove what the result would be, it would induce others, both private individuals and Trusts, supposing the latter were created, to follow the same course? I think it would have a very good effect.

8324. *Mr. Gipps.*] Why do you think that this work would be better carried out under Government direction than under the direction of local Trusts, seeing that in every country in the world such works are carried out by local Trusts, and that local people are more likely to look after them? I think it is a matter that is open to argument.

8325. Do you not think that the local people would know far better how to apply the water than a man hurrying up from Sydney and knowing nothing about the country? I think he should have a fair amount of time to make his examination and consult with the residents and practical men. Among local Trusts there is always so much difference of opinion.

Conservation above Dandaloo. 8326. *President.*] Do you know of any position above Dandaloo, on the Bogan, suitable for a dam and capable of storing large quantities of water for purposes of irrigation? I do not know of any; the country is too level.

Abyssinian wells. 8327. Do you not think Abyssinian tube wells would be applicable to the Monkey country? I think they would be worth trying. The water is not found at a great depth—not more than 14 to 25 feet. The Monkeys are different from the salt-bush plains. In a Monkey you can nearly always get water. We have no engineers in the bush, and the pumps would soon get out of order, so that where a well does not require to be deep, I think the simplest and cheapest plan is to sink a well in the ordinary way and draw the water up with buckets or some simple appliance. I think that in regard to the matter of conserving large quantities of water, the Commission would act wisely if they gave their attention to the country above Wellington.

THURSDAY, 18 *JUNE*, 1885.

At Sydney.

Present:—

MR. BARTON, M.P.,
MR. DONKIN, J.P.,
MR. FRANKLIN, C.E.,
MR. GIPPS, C.E.,
MR. LYNE, M.P.,
MR. M'MORDIE, M.I.C.E.,
MR. TARGETT, M.P.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. J. B. Meldrum, junr., called in and examined:—

Mr. J. B. Meldrum. 18 June, 1885.

8328. *President.*] Where do you reside? Tumbarumba.

8329. Have you been there any length of time? Now nearly five years.

8330. In what position? Road Superintendent.

8331. Under the Commissioner for Roads? Yes.

8332. Does your work take you all over the district? Yes, in the course of my duties I visit all parts of the district.

8333. You have had an opportunity during the time you have been there of becoming well acquainted with the natural features of the district? I have.

Road levels. 8334. In your official work have you taken the road levels? I have completed a series of levels from Tumbarumba, radiating all over the district—branch lines, which have all been reduced to one datum. I may say that since I have been there I have levelled the whole of the district, so far as the roads are concerned—at all events all the principal thoroughfares.

8335. Have you these levels with you? I have a condensed form, showing the difference in elevation of the main points in the district—the Murray River Valley and Tumbarumba.

8336. Will you submit those levels? The sketch I submit *(Appendix BB)* represents the various heights from Tumbarumba as the centre.

8337.

Mr. J. B. Meldrum. 18 June, 1885.

8337. You give the height of Tumbarumba as 2,950 feet? Yes.
8338. Burra 3,050 feet, and Boggy Creek, 3,005·95 feet? Yes.
8339. They are on the road from Tumbarumba to Tooma? Yes. Tooma at Woodhouse Bridge is 1,600·55 feet. Waleragang is 1,506·75 feet—it is a surveyed village reserve; Jinjellic Bridge, 20 miles from Waleragang, is 1,373·69 feet; and Maracket, 8 miles further down, is 1,328·90 feet. These are all levels along the road from Tumbarumba to Tooma, and from there along the Murray to Maracket. Levels from Tumbarumba to Maracket.
8340. You also give the height of a place called Lob's Hole? It is at a place called the Neurameramang Gap, Mr. Ricketson's station.
8341. You give the height there as 4,850 feet? Yes.
8342. *Mr. Gipps.*] Is that on the right or on the left-hand bank of the river? I cannot say that that is exactly the height above sea-level. I adopted the level as nearly as I could at Tumbarumba; the other is merely a barometric section. I suppose you would call it the west bank of the Tumut River.
8343. On the Kiandra side? No, on the Tumbarumba side—on the left bank of the river.
8344. *Mr. M'Mordie.*] If there are barometric readings and spirit level readings, ought they not to be distinguished? From Tumbarumba to the Tumut River they are barometric readings; on other side they are reduced spirit levels from Tumbarumba. Barometric readings.
8345. *Mr. Gipps.*] At what point did you take the height of the Tumut River? On the left bank, at the Wire Bridge. Height of Tumut River.
8346. *President.*] The height there is 2,400 feet? Yes.
8347. *Mr. M'Mordie.*] What is the datum of these levels? 2,950 feet at Tumbarumba.
8348. Is that height above the sea-level, the same as the railway datum? It is not to any definite datum; it is only adopted to show the difference of level between Tumbarumba and Maracket. Sea-level.
8349. *President.*] How far is it out from the sea-level? I cannot say; I have not tested it.
8350. Is it likely to be much out? I cannot say.
8351. Is there any bench-mark left from which these levels could be connected? I have a series of bench-marks from ¼ to ½ a mile apart; I left bench-marks all through. Bench marks.
8352. Where would the bench-mark nearest to the railway line be? At Maracket, I should think. There has been a preliminary survey of a line from Wagga to Tumbarumba. There is a bench-mark left at Tumbarumba.
8353. What is the level there? I have not connected the two, but I can do so when I return. My own bench-mark is in Parade-street, Tumbarumba. That would connect the whole of the levels.
8354. *Mr. Franklin.*] Is there a reference to the bench-mark at Maracket—where can it be found? It is on a tree—I cannot tell you exactly what tree; I think it is a white gum or an apple-tree. The last level taken by me is the last peg of the cutting at Maracket; it is at the upper end of the cutting.
8355. I suppose it could be pointed out without any difficulty? Without any.
8356. The whole of the pegs you refer to can be pointed out? Yes. At Tooma the connection is on the deck of the bridge.
8357. *President.*] In travelling about, have you noticed any place where you considered that any large quantity of water can be stored—take the Upper Murray first? I think that a large conservation of water could be made in the Tooma River, above its junction with the Tumbarumba Creek. The Welumba Creek, the Maracket Creek, and the Tooma River become one stream just before reaching that point. I think it is one of the best spots I have noticed. Storage.
8358. Is there any large basin above that point where water could be stored? It is all a natural basin there. The watershed is on three sides—from Tumbarumba, Neurameramang, and the right bank of the Tooma River. Natural basin.
8359. What would be the length of the dam at the point you mention? I may state that the point to which I refer is just above the point at which you were inspecting. There is another large rocky promontory immediately on the opposite side. I should say that the distance would be about 400 or 500 yards. The whole of the stream passes through that neck. Length of dam.
8360. Is there any large extent of banks there? You could throw the water back for miles. Back water.
8361. The fall is not too rapid? The Tooma is rather rapid, but the rest are only small streams. Fall.
8362. The fall of the country is not great? Not immediately; but when you get away about 2½ miles it becomes abrupt and broken country.
8363. How high would the dam have to be in order to store much water? I could not speak positively as to that point. I should say that it would require a very high dam. Height of dam.
8364. Do you know of any point further up the Murray where any large quantity of water could be stored? I have never been beyond Bringabronge.
8365. What sort of a valley is the Upper Murray—is it a rich valley? A very rich country. Upper Murray Valley.
8366. Rich agricultural soil? Yes; it could be used for agriculture, but it is now used entirely for grazing purposes.
8367. It is not heavily timbered? It is not timbered at all; the timber is dying.
8368. *Mr. Gipps.*] Is it not swampy in winter-time? It is very swampy; as you approach the river there is a succession of lagoons—that is, as far as I have been up. Lagoons.
8369. Do you know much of the head of the Tumut River? I have only been across once—about three years ago. I went up during the summer-time, and I examined the river carefully as I went up to report as to the possibility of a road being made across there. Tumut River.
8370. Where is that? From Tumberumba to Kiandra, at the bottom of Lob's Hole. It is rough, broken country. The fall is considerable, and the river runs rapidly.
8371. That is the Tumut? Yes.
8372. In that direction, do you know of large basins in which, by the erection of a dam, a large quantity of water could be stored? There is a point about 2 miles below the crossing-place from the Main Divide to the Talbingo Dam—to the foot of the Talbingo slope. There is a natural basin; the whole of Lob's Hole is a natural basin. Basins.
8373. Its outlet is into the Tumut River? Yes.
8374. What width is it across at the outlet? I really could not say. Width.
8375. Give an idea? It must be quite a mile or more; it is very wide.
8376. You have been up the Jingellic Creek to the Gap? I have sectioned the whole of the road from Jingellic to Tumbarumba over the Gap at Gad's Hill. The highest point between Tumbarumba and Jingellic is 800 feet above Tumbarumba. Jingellic Creek.

8377.

Mr. J. B. Meldrum. 18 June, 1885.

8377. *Mr. M'Mordie.*] Is that taken by spirit level? Spirit level—continuous sections from my central bench-mark at Tumbarumba.

Mannus Gap.

8378. *President.*] What do you pass over on the way? You pass over two ranges—one at the Mannus Gap. That is not more than 150 feet above the road to Tumbarumba, which is in a hollow. I should say that the Mannus Gap would be 300 feet above my bench-mark in Tumbarumba. The other gap is on Mundaroo Range; it is quite a low gap, about the same height as the Mannus.

8379. Have you any idea of the conformation between the gap at the head of Coppabella Creek and the gap at Gad's Hill? I cannot say; I have never been at Coppabella Creek.

Pass on Mannus Creek.

8380. Does not the road between the gaps pass over table-land? It does. I may mention that what they call the pass on the Mannus Creek, about 6 or 7 miles below where my road crosses, I fancy two large creeks unite—the Mannus Creek proper and Bell's Creek. They are both fairly-sized streams. The Mannus has a large natural bed, with hills all round. I think a large body of water could be conserved there.

Gorge.

8381. And the gorge is not very broad? Not very broad; it is comparatively narrow, I think.

Basaltic table land.

8382. *Mr. Gipps.*] Do you know the level of the divide as the road comes on the top—the basaltic table-land, where they are sinking a shaft to get coal? I did not think of it, or I could have put it on the section. It is 983·35 above Tooma.

Paddy's River.

8383. What is the level of the road as it crosses Paddy's River? I can give you that also. It is 1,298·96 above Tooma.

8384. That is close to the Burra? About 4 miles and 25 chains from the Burra. I think it is higher than Boggy Creek; I can give you the exact level of any point on that road. I will send you a sketch section showing all these points as connected with Tumberumba when I can find time to do so.

Checks.

8385. *Mr. M'Mordie.*] What checks have you had on the levels with which you have supplied the Commission? I have checked them as I progressed. I checked them by a series of falling levels.

Error.

8386. What is the greatest error you found in enclosing any circle? I used to take about every quarter of a mile—a little more if the country were open; in rough country, less. It would vary from fifty to seventy-five points—sometimes an inch. I have been as much as an inch out occasionally, owing to unforeseen circumstances arising in connection with the instrument or a mere accidental slip.

8387. You did not enclose any very large circle? No, I did not. For my own convenience and security I checked them at very short intervals—not more than a quarter of a mile at any time. I have corrected repeatedly on my bench-marks.

Work for Commission.

8388. Could you undertake any work for the Commission, or is your time fully occupied by official duties? At the present time I have rather more work than I can contend with; but in a month or more, when I get my camp off my hands, I may be able, with the approval of the Commission, to do something for them. My work will not be so heavy then.

Area of Lob's Hole.

8389. *Mr. Franklin.*] You mentioned Lob's Hole—is that a large area? Lob's Hole, from the crossing at the Wire Bridge to what they call the Walls, where the passage is, would be I think about 8 miles in length, and I suppose in width it would be about 5. It is a regular valley, with precipitous mountains on every side.

Outlet.

8390. Is there a depression lower than the outlet? The only outlet is the Tumut River.

8391. Is there a constant deposit of water in the Lob's Hole? No; the drainage is all towards the Tumut River.

8392. What is the approximate catchment area of the Lob's Hole? I have no data; I only made a flying visit.

Fall.

8393. I suppose there is a general fall from the centre towards the outlet? Yes. I may mention that the Yangobillie is a stream about the same size as Paddy's River—about the same volume.

The Yangobillie Dam.

8394. Any large volume conserved there would be due to the height of the dam? Entirely. The dam would be about a mile in extent—probably more; but I think a large body of water could be conserved there, and I think the elevation is sufficient. The only thing is to get a leading range by which the water could be conveyed to lower ground. I cannot speak positively as to that.

Formation.

8395. What is the nature of the formation at the site of the dam? It is all rock.

Rock.

8396. What rock? Granite, I think, principally.

Artesian water.

8397. *Mr. Donkin.*] Has any artesian water been discovered in your district? The only boring I know of is in connection with the gold-mining claim on the Bald Hill, on the basaltic range overlooking Tooma. I cannot state the depth. I know the boring is there, but I do not know the result. They were boring to find bottom if they could—to find a wash. They are tunnelling now. The whole of that district is one mass of springs in every direction—in any spur or gully there are springs—water is running continuously.

Springs.

8398. Do you know of any large supply coming out of one place? No, I do not.

Old tunnel.

8399. *President.*] Do you know of an old tunnel above Tumbarumba? On the left-hand side as you ascend the creek I believe there is such a tunnel, but I have never seen it.

8400. Could you obtain for the Commission some of the deposit taken out of that tunnel, and which is now lying near the mouth of it? Yes, I could.

8401. They are tunnelling, you say, on the Bald Hill—is that through granite? I think they are tunnelling through the granite.

8402. Right into the heart of the hill, at a point where the granite and basalt meet? Precisely; the wash which contains the gold is on the top of the granite, between the granite and basalt.

8403. What is the height of the hill above where they are tunnelling? 500 or 600 feet at the least.

8404. A short time ago did you receive a telegram from me asking you to meet Mr. Gipps? I did.

8405. And did you reply that you would do so if you could? I said I would use my best endeavours to be there.

Meeting with Mr. Gipps.

8406. You did not meet Mr. Gipps? I did not do so, and I will explain why. I was away on a tour of inspection; I was down at Dora Dora; I did not return, I think, till the Monday evening or Tuesday morning. I received your telegram on the following morning; I wired to you that I would meet Mr. Gipps if I could; I sent another telegram to the Commissioner, containing your request and asking for his instructions.

8407. Did you get any reply? I got a reply to await instructions.

8408. You have not received any further instructions? No.

8409. Why did you not let me know that you were not going to meet Mr. Gipps? I expected to hear on the Tuesday or Monday. My reason for not further telegraphing to you was that I thought Mr. Gipps had probably

probably been there and returned, as the day upon which I was to meet him had passed. Not receiving any further communication from the Commissioner, I did not proceed. It is one of the departmental regulations that I should receive all instructions through my chief. Mr. J. B. Meldrum. 18 June, 1885.

8410. Had you met Mr. Gipps you could have given him the information you have given us as to the levels. Yes.

8411. Waleragang is in the centre of your work? There is only a small contract going on there now.

8412. Had you so much work on hand that you could not have met Mr. Gipps, supposing you had not received a telegram from the Commissioner? I was very busy at the time, as I always have been.

8413. But you could have met Mr. Gipps? Yes, if I had received instructions.

8414. That was the only reason you had for not meeting him? Yes; I should have been only too happy to give any information of the kind.

8415. You and I had a conversation on the tram some time before about this matter, had we not: Did I not explain to you that Mr. Gipps was going to the Upper Murray, and that I would like you to let him have the levels? I do not quite remember it; I have no doubt that that is the case.

8416. *Mr. M'Mordie.*] You say it is a rule of the Department that you should not leave your work without instructions from the Head of the Department? That is one of the departmental regulations. Departmental regulations.

8417. Do you think it is a good and useful regulation? I cannot speak as to that.

8418. Do you think it would cause inconvenience to public work if you were liable to be called off by any one except your superior officer? Undoubtedly, because during my absence the men would be waiting for measurements. Works have to be set out, and they would have to be held over until my return. Without a special authority from the head of my Department I could not leave my work or the district; I could not take up any matter foreign to my Department.

8419. Is that a good rule in the management of a large Department? I think so, as far as I can see. In the present case, when I received the paper requesting my presence here to-day, I referred it to the Commissioner, and received instructions from him to proceed to Sydney.

8420. *President.*] The telegram I sent you did not necessitate your coming out of your district? No.

8421. How far from the place was the centre of your operations? In a straight line about 25 miles.

8422. *Mr. Franklin.*] Your projected work in the district is reported to the Commissioner? Yes.

8423. And he approves and instructs you to proceed, or otherwise? Yes.

8424. *Mr. M'Mordie.*] Did you receive your summons to attend here to-day through the Commissioner? No; directly through the Board. It did not come from my office in any way.

8425. *Mr. Gipps.*] Were you not down at Jinjellic the day before I arrived? That is where I came from. I received Mr. Lyne's telegram on my arrival on Monday evening. I returned home too late to wire that night.

8426. Do you receive actual definite instructions as to inspecting the roads? No.

8427. Since that time have you not been inspecting the Upper Murray Road? Yes; I came along that way last Saturday. I passed Waleragang.

Mr. Harry A. Gilliat called in and further examined:—

8428. *President.*] You have given evidence to the Commission before? I have. Mr. H. A. Gilliat. 18 June, 1885.

8429. After examining that evidence, you desire to give additional information? I do.

8430. And you have prepared certain statements on two papers? Yes.

8431. Will you kindly read them? Certainly.

Witness read the following papers:—

MINUTE PAPER.

Subject:—Notes on the mud-springs and some of the shafts and borings for underground supply on the road between Ford's Bridge (on the Warrego River) and Hungerford (on the Paroo River).

Department of Mines, Stock Branch, Bourke, 25 May, 1885.

HAVING recently completed an inspection of the mud-springs on the Bourke to Hungerford Road, with the view of their being utilized in permanently watering this important feeder to the Railway at Bourke, I have the honor to submit, for the consideration of the President and Members of the Royal Commission, Conservation of Water, the following memoranda:—

The distance between the Warrego and the Paroo by this road is about 100 miles, and the general direction north-west.

The first of this series of springs is the Coonbilly, about 22 miles from the Warrego; but as it is some miles off the traverse of the new road, and has, I understand, been dealt with by another witness, I pass it without notice.

The Yungarrina spring (1A on tracing—*Appendix* CC 1) is about 27 miles from the Warrego, and one of the largest, with an area of about 4 square chains. The highest part of the mound—which in most places is sufficiently firm to bear the weight of a man—is about 3 feet above the level of the plain; in the centre a roughly-timbered shaft has been sunk some 6 feet in depth, and the water stands in it about 2 feet 6 inches above the surrounding level, and overflows both from the shaft and other portions of the mound into trenches, some 2 and 3 feet deep, that have been cut around two sides. The overflow from these finds its fall for about half a mile on to the plain, where it disappears, from evaporation, absorption, and consumption by the stock in the neighbourhood. I saw a 400-gallon tank filled by baling from the shaft, and found the water lowered 9 inches. In its present unimproved state, and allowing for the waste over the plain, I do not think the supply can be estimated at more than 1,500 to 1,800 gallons per diem. The quality of the water is excellent.

There is an outcrop of quartzite 25 feet above the level of the plain about 500 yards east of the spring, and indications of the same ledge to the north.

The Boongunyarra Spring is about 6 miles beyond. All indications of the old mud-spring, if there was one, have disappeared. The present basin has at some time been dug out, and apparently has been so poached by the trampling of cattle that the overflow I noticed four years ago has ceased, and the water stands about 6 inches below the edge of the basin, an occasional bubble indicating the pressure of water from below. At present the supply must be very limited.

Half a mile beyond is the Black or Back Spring. No attempt appears to have been made to open this. It is overgrown with weeds, and for an area of about a chain square covered with black vegetable ooze and water. I noticed the skeletons of several bullocks that have been smothered in it. I anticipate a strong supply will be obtained here. On the north and west outcrops of the same quartzite ledges previously noticed occur.

Mr. Langloh Parker's manager (Mr. M'Crae), at his camp, half a mile beyond, has put down a shaft about 50 yards south of an old spring not flowing or boggy on the surface, but quaking under foot. Mr. M'Crae was unfortunately absent, but from what I could learn in the camp the shaft is about 27 feet deep, and 8 or 10 feet in the rock.* At that depth the water was struck, and rose 19 or 20 feet in the shaft, in such strong supply that 10,000 sheep were watered at it during the late drought. A selector has put down another shaft a few hundred yards away and struck the same water. The quality is good for stock, but too brackish for domestic purposes. *Quartzite. Since confirmed by Mr. M'Crae.

12 miles from here is the Yantabulla group, the most numerous on the road; the first and largest is the Whip Spring, quite unimproved, but from which there is a considerable outflow, there being quite half an acre of water around it. There are large outcrops of the quartzite to the north and east of the springs, and between the Whip Spring and the principal

Mr. H. A. Gilliat. 18 June, 1885.

group there is a ridge evidently of the same formation. Mr. Buckley, the landlord of the inn, informs me that he has put down nine or ten shafts, most of which proved salt, and all unfit for domestic purposes, except the one he has now in use. This is sunk 40 feet in an old spring, and bottomed on sandy drift, the water rising to within 10 feet of the surface; the shaft is circular, and walled with stone. He adds that, when the well is baled out, a person standing in it can hear the mud working and moving on all sides. The water is fairly good and used for all domestic purposes, but appears impregnated with soda. Buckley states the daily yield at about 150 gallons, but I have reason to think this is very much under-estimated.

(say 2,000 gals.)

A few hundred yards from this well is another spring, where an old Chinaman has formed a garden; he dug out some 400 cubic yards from the spring, and told me that the blue mud forced up from below had driven him out several times, until he carted in a number of loads of stone. It yields him, he says, from 600 to 700 buckets per diem; but as he spoke very imperfect English I cannot depend on his figures.

From here to the Warroo Springs is 32 miles. At 2 chains from it, the manager of Brindingabba, Mr. Rudder, informs me, he sank a shaft 20 feet; the water rose in it 18 feet, very salt (No. 3 tracing). 5 chains east of the spring he sank a shaft 60 feet, and bottomed on blue mud, which broke into the shaft with such force and in such quantity as to compel its abandonment. Apparently a great supply below the mud. The Warroo Spring is 17 miles south-easterly from Hungerford, and 15 miles south from it is the Tyngynic group. A mile to the east of these Mr. Rudder put down a shaft for 60 feet through black clay, and obtained a supply of from 7,000 to 8,000 gallons of salt water. A 5-inch bore was then put down for 230 feet, through white clay and black drift, and abandoned in the latter (No. 7 tracing).

*The portion of tooth I exhibit from this spring is that of diprotodon.

At the Tynganic Spring, a shaft 20 feet deep struck salt water in white drift and water-worn boulders. No supply in this shaft. 15 feet below the surface were found fossil remains of a mammoth kangaroo.*

The Tynganic Spring itself yields excellent water, in sufficient supply for a boundary-rider's hut.

Quarter of a mile south-west, on the Willera Run, the owner has sunk a shaft 40 feet and obtained a supply of excellent water, estimated at 10,000 gallons per diem; the shaft is near another group of springs, and between them and the Tynganic.

* M'Comas offered to make the Paroo run by using his lifts at these springs.

I am not acquainted with springs south of these, with the exception of the Goonery, Wee Watta, Mullyeo, and those at the Peri Lake, on the Lower Paroo, where the supply, although almost unimproved, is sufficient to water 20,000 sheep.*

To the north they are of frequent occurrence, both up the Warrego and up Cooper's Creek and the Mitchell; and down the Cloncurry and Flinders, the most northerly, I am personally aware of being a group just under Fort Bowen, between the Flinders and the Saxby Rivers. I have also heard the Rev. J. E. Tenison-Wood speak of having seen them in Western and South Australia.

I may add that where I have noticed the outcrop of ledges the springs are apparently more numerous or the supply more plentiful. The ledges, I have remarked, are north of the springs. If there is a subterranean flow, this may indicate that it has a northerly direction.

My inquiries as to the effects of the weather on the springs have met with the same reply—that they rise before wet.

Mr. Rudder (Messrs. Christian's manager) has kindly furnished me with the following particulars in connection with the search for underground supply on Brindingabba:—

Shaft No. 1 (see tracing).—Depth, 66 feet; 94 feet of 3 × 3 feet drives at bottom; red sand at surface; reddish clay with gravel to clay-slate, in which water was found. Supply: watered 12,000 sheep through the recent drought. Quality excellent, and used for domestic purposes.

Shaft No. 2 (tracing).—120 feet deep; strata, red clay, 18 feet; then blasting through 14 feet of rock, then through soft white sandstone, till the water was struck. Water rose 90 feet in shaft, the same level from surface as at No. 1; 40 feet of 3 × 3 drives at bottom. About 4,000 gallons per diem. Same quality as at No. 1.

Shaft No. 6 (tracing).—150 feet deep; 5-inch bore, 83 feet. Supply, 100 gallons per diem. Good water.

Shaft No. 9 (tracing).—38 feet 5 inches; bore, 197 feet; stiff blue clay in shaft; bore through various clays, with lumps of pyrites near the bottom. Water salt; supply, 4,000 gallons per diem.

Shaft No. 10 (tracing).—35 feet. Salt water, very bitter; no supply.

Shaft No. 11 (tracing).—Over 100 feet deep. Supply small. Water analyzed in Sydney, and said to contain a powerful mineral poison; Mr. Rudder thinks, but is not sure, that it is arsenic.

Caiwarra artesian-well, on Togwarrah Run, across the Queensland border from Brindingabba, 135 feet deep, of which 50 feet is said to be through granite. While drilling the bottom broke through and the water spouted up; it rose in the shaft till it flowed over the surface; quality of water, first-class.

Boring with a 5-inch Tiffin machine, Mr. Rudder gives his average progress per diem at 16 feet through clays, 18 inches through rock.

HARRY GILLIAT,
Chief Inspector Public Watering-places.

MINUTE PAPER.

Subject:—Notes on some localities for conserving water west of the Darling River.

Department of Mines, Stock Branch, Bourke, 28 May, 1885.

I BEG to submit, for the consideration of the President and members of the Royal Commission on the Conservation of Water, the following memoranda:—

1. That the Darling and its tributaries may be regarded not only as collecting the flood-water of the rainfall in New South Wales, but in a large measure as channels that bring in from Queensland great bodies of water falling in that colony during the more or less regular tropical rains over their watershed, and that it is of frequent occurrence that these streams come down in flood without any or with a small rainfall in this Colony.

2. With the limited rainfall of the west, this supply must, I think, be regarded as an important factor in any measures dealing with water conservation in this region.

3. It may perhaps be of some service, commencing in the extreme north-west, to notice some of the streams and water-courses, pending survey, that appear to offer some of the necessary conditions for service in collecting flood-water into natural or artificial reservoirs.

4. Commencing with the Evelyn Creek, which rises in two heads among the low ranges around Mount Poole, in the bed of which are Depôt Glen water-hole—Sturt's Water-hole, and lower down, the Milparinka—and others of more or less value for stock and local supply. The creek, after a course of some 70 miles, empties into Lake Cobham; its catchment ground, consisting of low rolling downs and plains, with a firm pebbly soil, collects water so rapidly that an inch of rain will send it down for 50 miles. It is at present the principal, if not the only, feeder of Lake Cobham, 8 miles in length by 2 miles in width, filled by the last January rains, and now 27 feet deep. This water will last, according to the local estimate, nearly three years.

5. Some 50 miles to the east of the Evelyn Creek, the Bulloo River, rising and fed in Queensland, crosses the Border and at once runs out into an overflow which, when the tropical rains send the Bulloo down in flood, wastes into a large shallow bed known as the Carypundy Swamp, some 70 miles in length by varying breadths, where it soon disappears from absorption and evaporation.

6. Between the Evelyn Creek and the Bulloo, and also heading in Queensland, a creek comes down in which is the large Wampah Waterhole; this runs into the Whittnabreenah, which, flowing to the south-east, is perhaps the main feeder, but at all events runs very close to the Taltachara and Terrawinda Creeks, emptying into Lake Yantara, about 14 miles in length by 6 miles in width. About 12 miles south-west of Yantara lies the Salt Lake, of still larger dimensions, and a mile beyond Lake Cobham previously described.

7. A preliminary survey and computation of the flood-water of the Bulloo will of course be required. This being satisfactory, I think very inexpensive works, chiefly levees, will be sufficient to divert the Bulow overflow, or a portion of it, before it wastes into the Carypundy Swamp, into one of the channels of the Whittabreenah, the Taltacharra, or the Terrawinda Creeks, by that into the storage of the Yantara Lake. This filled, the overflow, if sufficient, to be led by improving the present channel into the Salt Lake, and thence to supplement the supply given by the Evelyn Creek and to Lake Cobham; conserving, if the scheme proves practicable, in these three large natural reservoirs, water collected at periods when there has been but a limited or perhaps no local rainfall. Actual survey will be required to indicate how far these lakes and the channel fillings them may be tapped for the supply of artificial reservoirs.

8. The Paroo River affords an opening for a plan of far more importance, and at an outlay so small in proportion to the bodies of water that may be conserved, that it will, I think, be found unequalled on any river in the Colony. (*Appendix* CC 2). After careful examination, I am strongly of opinion that the substitution of weirs for dams on the Paroo, and the construction

construction of low levées where required, to confine the flood-water and prevent its wasting over the great cane-grass swamps and clay-pans that for many miles of its course form the only apparent bed of this river, will cause to fill, with a minimum flood, the great chain of water-holes and lakes along its course, ranging from half a mile to 12 miles in length—such as the Warramurtie, Tongo, Yantabangee, Opeloko, Lakes Peri, Dick Copago, and others, where the water now rarely reaches unless in exceptionally heavy floods—affording storage for immense bodies of water, extending certainly to within 20 miles of Wilcannia, and probably further. How far these great natural reservoirs may be utilized for distribution must be determined by survey, but from the character of the country I think it probable very simple works will be found sufficient. Mr. H. A. Gilliat. 18 June, 1885.

9. The Cuttaburrra overflow.—The Cuttaburra is an effluent from the Warrego, and flows (as shown in tracing B) as a creek to the Mukajooro Waterhole, below which it wastes over the plains between the Warrego and the Paroo, and in a few miles spreads to a width from 1½ to 10 and 20 miles, and during a flood appears like an inland sea, contracting and expanding according to the features of the surrounding country, and in heavy floods extending as far south as Gorimpo. This overflow, if confined by levees, might be tapped on either side of its course as required, to fill tanks conveying the surplus, as found, after survey, most suitable to swell the supply of the Darling or Paroo.

HARRY GILLIAT.

Caiwarra spring.

8432. *Mr. Donkin.*] Is the Caiwarra spring still flowing? I understand it is.

8433. You do not know the supply? No; but it must be considerable, from its filling the shaft.

8434. Is the shaft slabbed? Yes.

8435. You spoke of Mr. M'Comas being on the Paroo;—where did he intend to bring the supply from? From Peery Springs. They are directly in the bed of the Paroo.

Peery Springs supply.

8436. Is the supply at Peery Springs larger than the supply from Yantabulla? Yes.

The Paroo.

8437. That is about where the Paroo runs out? The Paroo runs, in flood, for 40 miles below the Perry Springs.

Run of springs.

8438. *President.*] Have you come to any conclusion as to the run of these springs—can you define it as being in any direction? I am convinced that Mr. Wilkinson's view is right—that they are subterranean waters forced up along a great fault in the cretaceous bed running across from south-east to north-west.

Subterranean waters.

8439. From that would you suppose that the whole country underneath contained these subterranean waters? I am convinced, from the results of our boring, that the whole of this cretaceous area is water-bearing at a certain depth.

Artesian water.

8440. Artesian water-bearing? Yes.

Suggestions.

8441. Is there any particular point outside of the papers you have read as to which you think your evidence would be of value to the Commission? In reading this first paper upon some of the localities for conserving water, I merely read it as a series of suggestions that are not only applicable to the one stream but to all the streams upon the Darling watershed; for instance, the Warrego, the Culgoa, the Biree, and the Narran could be dealt with in the same way.

The Willandra.

8442. Do you know the features of the Willandra Billabong? I know the Willandra Billabong breaks away from the Lachlan, near Hillston, and wanders for a number of miles across the plains to the south-east of Lake Terrawynna.

8443. In the flood of 1870 do you know how near the waters of the Lachlan and Darling approached each other? I think in my former evidence I gave the distance as within 15 or 20 miles.

Mud springs country.

8444. *Mr. Targett.*] What is the length of the country upon which these mud springs continue? In the particular line to which I have referred the distance would be about 75 miles; but they extend for 180 miles up the Warrego, 200 miles up Cooper's Creek; on the Mitchell, 300; and down the Cloncurry and Flinders, 350.

Course.

8445. Is the course well defined in most cases? They appear in lines following the course of the Warrego fairly direct. They are running at an entirely different angle up the Warrego—north-east and south-west—and in the other cases I have illustrated on the map (*Appendix* CC 1) the direction is north-west, apparently leading to a junction.

Wampah waterhole.

8446. *Mr. Donkin.*] Is the Wampah waterhole permanent? I have never heard of it being dry. We have not a long knowledge of it. It is about 2 miles in length, and is about 27 feet in depth.

Tongowoko Creek.

8447. Do you know the Tongowoko Creek? Yes; the whole of that country has small water-courses running through it.

Yancannia hole.

8448. You did not mention the Yancanntia Waterhole; that is permanent? Not more than any other. It is on the map; but I did not mention it because it does not come within the scheme I mentioned to the Commission.

Bulloo River.

8449. You spoke of the Bulloo River running into the Carypundy Swamp; in that swamp are there any springs similar to those on the Paroo? I have not seen any in the part of the country I have been over, but I have not been over the whole of it.

Artesian well.

8450. You mentioned an artesian well on the Caiwarra Run? Yes.

8451. Do you know of any other instances of artesian supply in that neighbourhood? There are artesian wells at Wee Wattah and Mulyeo.

Supply.

8452. Is the supply constant there? The supply from Wee Wattah when the bore was first put down was the largest supply of artesian water struck in this Colony. At one time it was equal to 50 gallons a minute, but they lost it in sinking, and they have not since obtained so large a supply. When I was last there, to the best of my recollection, they were getting about 8 or 9 gallons per minute.

8453. You do not know of any larger artesian supply in the Colony? No. It all depends whether we adopt as artesian any water that rises above the surface or that rises only to a particular distance in the shaft. In one or two cases on Dunlop the water has risen from a depth of from 400 to 600 feet to within 20 feet of the surface. Probably if the shafts had been piped the water would have come over the surface.

Sinks.

8454. *Mr. Gipps.*] Are there any sinks in the neighbourhood of the mud-springs? I do not know of any sink in the Colony, except at Lake Narran. I have seen plenty of sinks on the west coast of the Pacific. At Lake Narran there is undoubtedly a sink.

Coolaman holes.

8455. Are there none on the other side of the Darling? I have seen small coolaman holes where local flood-waters will run away, but not where any large body of water disappears.

8456. Are there any of these coolamans in the neighbourhood of the mud-springs? I have seen none.

8457. Are there no sink-holes at Goonery close alongside the mud-springs? Not to my knowledge; I have not noticed any. I know that the old bore is down in the swamp where the old spring was.

Line of rock.

8458. *President.*] In one of your papers you said that north of the springs, as a rule you find a line of rock? I said that the ledges I had noticed were all to the north of the springs.

8459. Would you infer then that the drainage into this cretaceous formation is all from the south? I am not prepared from evidence to make any actual inference. I take it as a possible indication that if there be an underground current, which there may not be, the flow is northerly.

8460.

Mr. H. A. Gilliat. 18 June, 1885.

8460. Can you give no definite information on that point? Nothing more than that some geologists consider that there can be no break away for an underground supply beneath the old Barrier Range and the range which comes up by Cobar and Dunlop; they think that if there be a subterranean flow the escape must be to the north.

8461. If it comes from the south or east it does not come from the Queensland watershed? The statement that the ledges are north of the springs need not interfere with the supposition that the waters might come from Queensland or eastern watersheds.

THURSDAY, 25 *JUNE*, 1885.

Present:—

MR. DONKIN, J.P.,
MR. LYNE, M.P.,
MR. MURRAY, M.P.,
MR. TARGETT, M.P.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. George Frederick Ritso called in and examined:—

Mr. G. F. Ritso. 25 June, 1885. Malvern Waterworks.

8462. *President.*] What is your profession? I am a civil engineer.

8463. You have practised in New Zealand, I believe? Yes; I was Engineer of the Malvern Waterworks, Canterbury, N.Z.

8464. And you wrote the paper which you now hand in respecting those works?* Yes. The object of the paper was to illustrate the method of distribution and the method of construction of the falls carrying the water down to the plains.

Supply.

8465. Are these extensive works? They supply 90,000 or 100,000 acres of land with water.

Head works.

8466. Is that done by diverting a stream or conserving the water at the head of a river? By means of head works, which divert the water from the river Kowai on to the Canterbury plains. First of all there is a tunnel, and then open channels. The tunnel is a little over half a mile in length, and that conducts the water into an open channel, and thence down the Canterbury plains.

Cost.

8467. Have you any idea of the actual cost of the work? About £35,000 has been expended altogether in making surveys and constructing the works.

8468. What were the ruling rates for labour when the works were constructed? The concrete falls cost from £2 to £2 5s. per cubic yard; the falls at the upper portion of the work cost £5 each; that is with Portland cement at from 16s. to 18s. per cask; of course the shingle was on the ground. The timber falls cost about 18s. each, the Council supplying the timber and cement; the total cost of the timber falls was about 30s. each. The earthwork in the main channel, where spades were used to any extent, cost from 7d. to 1s. per cubic yard; but when we got lower down we divided channel into smaller channels, and then the work was done at per chain. When we came to make the channels from 7 to 8 feet wide the cost was about 5s. per chain, or about £20 per mile. Lower down, when we came to make channels about 3 feet wide, the cost was about £4 per mile. I may state that on works in the Ashburton district a specially designed plough for excavating was used; this plough would take out in a single ploughing 2 feet 6 inches of earth; it was drawn by 7 or 8 horses, and it threw the earth on each side in a kind of bank. The man who used the plough was the contractor for the work in the Malvern district; but in forming the channels there he preferred to do the work with an ordinary scoop, as the plough was hardly wide enough for the channels that we wanted.

Distances.

8469. What distance was the water conveyed? From the head works to the seaboard the distance is about 40 miles, and the width of the country from the head works to the railway line is about 25 miles. The water is taken from the Kowai River into a tunnel 46 chains in length, and thence into an open channel 12 feet wide, with 250 falls. The channel is then divided into two channels, each 8 feet wide, with timber falls, of which there are 2,300 in the channels. Further on these two channels are divided into smaller channels without falls. These small channels are about 3 feet wide, and it has been found that the water runs through these without scouring the ground. The great difficulty which had to be contended with in carrying out the works was the fall, which is about 80 feet to the mile at first, gradually diminishing to nothing at the seaboard. About half-way down the fall is about 20 feet to the mile. The fall is most regular, gradually diminishing all the way.

8470. What was your position in connection with the works? My work commenced when the provincial Government undertook the head works; I was then assistant engineer under the provincial engineer. When the provincial Governments were abolished the general Government took over this work and took me over with it as resident engineer. It was then handed over to the Selwyn County Council, and for a time I had nothing to do with it. Another engineer was placed in charge, and he put in about 2 miles of race about a third of the way down, which came to grief during a flood, owing to improper construction. I was again appointed engineer for the works, and I completed them.

Result.

8471. Has the work been a success, as far as the irrigated country is concerned? Yes, a great success.

Enhanced value of land.

8472. What do you consider has been the increase in the value of the land which has been irrigated over its value in its original state? It is difficult to estimate that exactly; but I should think about £2 per acre is the increase in value due to the fact of the district being supplied with water. Irrigation proper is not yet practised to any extent in the district. Land in the district would not be worth more than £4 per acre without water, and with water it is worth £6 per acre now.

8473. Not more than that? No; you must remember that the whole country is in a very depressed state. I think that my estimate as to the increase in value is a moderate one, because the value of land differs considerably, and the value of some classes of land has increased more than that of others from water supply.

Use of water

8474. *Mr. Donkin.*] Was the water used for pastorage or cereals? It is an agricultural country; there is about a foot of soil—good in the production of wheat—on top of an immense bed of shingle. Generally the land has been ploughed up and two or three crops taken off it when it has been laid out in grass for three years or so. The water has not been fairly used for irrigation up to the present—in fact it is regarded more as a supply for domestic purposes—but in one case a farmer irrigated about 300 acres; that was before the water was distributed below; he had the full use of the water, and he ploughed furrows all over his land

* *Vide* "Proceedings of the Institution of Civil Engineers," vol. lxxiv, Session 1882-3, part iv.

Mr. G. F. Ritso. 25 June, 1885.

so as to thoroughly irrigate it. The result was that he got such an immense growth of grass in the summer-time that he was able to let the land at a rental of £1 per acre for some years; the growth of grass was so astonishing that people went up there to look at it; it was principally rye-grass.

Purpose of works.

8475. *President.*] Then the scheme is for the distribution of water for general purposes rather than for irrigation? The idea is to educate the people up to the value of irrigation by giving them water to make use of in any way they may desire, on their various blocks of land.

8476. The races are not intended for irrigation purposes? They are distributing and not irrigating channels.

Irrigation.

8477. Then the increased value of one-third of which you place on the land is the increase arising from water distribution and not from irrigation? Yes; the fact of the matter is that the people have no idea of the value of irrigation, and I do not know whether in this case the supply of water is sufficient for the purpose; the supply is about 200 gallons per acre per diem, which is not very large.

8478. Was the work undertaken by the Government as a kind of specimen work? I do not think so. In 1873 the Government proposed a vote of £25,000 for the work.

Object of works.

8479. *Mr. Donkin.*] Was the object of the work to supply Canterbury with water? No; an influential land-owner in the centre of the plains had been an Indian officer and he knew a great deal about irrigation; he had no water and no possibility of getting any unless it was brought down from the river; he knew that that could be done, and being a member of the Legislative Council he never rested until the Government voted a sum of money to be expended in the work.

Regulation of supply.

8480. *President.*] It had no further significance than that? No; the whole district was destitute of water.

8481. *Mr. Donkin.*] Do the proprietors of the land pay for the water? Yes; the water supply is divided into seventy-two heads, and the country into seventy-two blocks of 1,500 acres each. Each of those blocks gets a head of water, the supply being regulated by iron gauges. The proprietors have to pay for the necessary works to distribute the water over their holdings.

Water rights.

8482. *President.*] How do they acknowledge water rights in New Zealand;—suppose a man at the head of the river wants water does he get priority over the man further down? No; each holder of a block of 1,500 acres gets 1-72nd part of the water flowing in the race.

8483. He only gets his proportion, no matter what his position from the head works may be? Yes.

Effect on river.

8484. How is the river affected? The river from which the water is taken is a tributary of the Waimakiriri, and the head works are not far distant from the junction of the two rivers. There is such an immense body of water in the Waimakiriri River that it is not affected to any appreciable degree by the water which is taken out of the Kowaï River. There are no frontage rights in New Zealand—in selling the land the Government reserve a water frontage to rivers, lakes, and the sea of a chain in width.

Water rights.

8485. But have not the owners of land the Common law right to the water in the rivers. Is one man allowed to divert water from its natural course to the detriment of his neighbours below;—have the Legislature passed any law on the subject? I am not aware whether there is any local law, but I know that a private individual has constructed head works on the Rakia River to take water over his property, and no complaint has been made by people below, but in this case there is always a large body of water running.

8486. *Mr. Murray.*] I suppose that in such a case permission would have to be got from the Government to take the water across the reserve? I do not know. Any man who wishes to take water across a road has to get a license from the Road Board; the license is according to the form which I now hand in. (*Appendix* DD 1.)

Climate.

8487. *President.*] What is the nature of the climate in the Canterbury Plains District? There is a rainfall of about 22 inches in the year; the country suffers very much from dry north-west winds in the summer.

8488. Is it at all like the climate in the interior of New South Wales? I should call it an exceedingly dry climate.

Rainfall.

8489. *Mr. Donkin.*] Is the rainfall distributed over the whole of the year? No; it comes in the winter; in the summer-time there is no rain for four or five months sometimes; there were droughts for three years in succession on these plains, and the oats and wheat would spring up to about 6 or 7 inches in height, and then come out into ear.

Change of climate.

8490. Do you think from your experience in New Zealand that a system of water distribution and irrigation could be carried out in the interior of this Colony? I have had no experience here—I can only explain New Zealand conditions—but I should think so; I see no reason why it should not be done. I may state that since the water has been running down the channels over the Canterbury Plains there has been a change in the climate to a certain extent; the evaporation of the water from the channels makes the atmosphere feel moister.

Trusts.

8491. Do you think that works of the kind should be carried out by local Trusts or otherwise? In this particular case the work was practically carried out by a local Trust; three members of the Selwyn County Council were appointed a Water Races Committee. These gentlemen were residents in the district, and I, as engineer, submitted my suggestions to them, and they submitted them to the Council. The local knowledge of these gentlemen was of immense advantage.

Loans.

8492. Do you think that local Trusts should be formed having power to borrow money from the Government to construct works of the kind, guaranteeing interest on the money so borrowed, or that the works should be carried out by a Central Governmental Department? It depends to a great extent on the districts. I can easily conceive that if a number of small local Trusts were created they might clash with each other, unless there was some central body to govern them; you want local knowledge, and at the same time a central head to produce unity.

Local Trusts.

8493. As a general principle, do you think that the whole matter ought to be kept in the hands of the Government, or that the works should be entrusted to local Trusts under the conditions which I have stated? I think that as a general rule the Government ought to have control over the whole matter, because local jealousies and considerations might upset things. With regard to the works to which I have referred, if the matter had been left in the hands of the people of the district, I doubt whether the works would ever have been carried out. There was great opposition to the scheme at first on the part of people lower down, who were afraid that the water would be monopolized by three or four persons at the head of the channels.

8494. Do you not think that that is a feeling which would disappear when people became acquainted with the advantages of irrigation? It did disappear in this instance; as soon as the people saw the water flowing on to their neighbours' blocks they began to clamour for it too.

8495. Then you think that the objection would only exist in the inception of the works? I think that a combination of local Trusts and Government supervision at the same time would be the best plan, that is to say,

Mr. G. F. Ritso. 25 June, 1885.

say, that a central Board should approve of the borrowing, and perhaps regulate the rating, but the local Boards should be consulted as to the method of carrying out the works in detail; local people must know best what the local requirements are.

8496. Have you any idea as to the cost of preparing land in ordinary cases for irrigation? I have had no experience to guide me on that point. On the Canterbury Plains very little preparation would be needed, as the ground has a gentle slope. I do not know of any instance in which experiments have been made.

Water-rate. 8497. What is the rate charged for the water there? £15 per head of water, each head supplying a block of 1,500 acres with 1-72nd part of the water in the race as near as the supply can be gauged; the water is delivered at any place in the block which the owner thinks most suitable for his purpose. In 1882 the revenue was about £1,000, but since then I have been told that the rate has been increased.

Supply. 8498. *Mr. Murray.*] What volume of water does each head give? 200 gallons per acre per diem, or about 30,000 gallons per block per day.

Licenses. 8499. Then the charge is about £1 per 100 acres? Yes; licenses are also issued at £1 per annum, which entitle people to cart water from the races for domestic purposes.

Supply in Ashburton District. 8500. *President.*] Do you know of any other similar works which have been carried out in New Zealand? In the Ashburton district about 300,000 acres of land have been supplied with water for domestic purposes; the supply is about 20 gallons per acre per diem. About £10,000 was spent on this scheme; there are no falls in connection with it; they run the risk of taking the water down in small channels 4 or 5 feet wide, and running to a certain extent to a gradient according to the contour of the country.

8501. Most of the information which you have given us, I presume, is contained in the pamphlet which you have handed in? No; I am giving you more information, because the pamphlet was written only for the purpose of illustrating the block system and the method of gauging the water. I produce two Acts of Parliament relating to the works. (*Appendices* DD 2 *and* DD 3).

Water districts. 8502. In creating water districts, what is the first step as to defining the boundaries? Maps showing the boundaries of the proposed districts are deposited at the Road Board offices, and the people are invited to inspect them and to state if they have any objection to being included in the districts. If within a certain time no objections are made I think it is assumed that the people consent to the creation of the district.

Poll on rating. 8503. Will the Government proclaim a water district if a certain proportion of the inhabitants in the locality petition for it? I do not know. A poll is taken with respect to the rating.

Frontage reserves. 8504. *Mr. Donkin.*] Is there any law controlling the right to impound water? I do not know.

8505. Are the frontage reserves to the rivers open to the general public? The reserve is a road.

8506. And the proprietors of the adjoining land cannot fence off the water frontage? No.

Supply of Kowai River. 8507. *President.*] Is it snow water which runs in the Kowai River? To a certain extent; there is a range of mountains at the back from which the rivers are fed, and consequently water from melted snow runs in them at times when there are droughts on the plains. I may add that the soil on the Canterbury plains is exceedingly favourable for irrigation, owing to its being well drained, with a substratum of shingle.

8508. *Mr. Donkin.*] But do you not think that if you put much water on to the soil it would wash it away? No, because the country is flat, and there is a foot of good stiff soil resting on a substratum composed of shingle and clay.

Mr. Thomas Willans Conolly called in and examined:—

Mr. T. W. Conolly. 25 June, 1885.

8509. *President.*] You are a licensed surveyor? I am a first-class staff surveyor of New South Wales.

8510. In which part of the Colony? I have been stationed on the Lower Darling. I have had charge of nine counties in the south-west part of the Colony for the last four years.

8511. During that time have the seasons been dry? Very dry all through.

State of Darling. 8512. And the Darling has been very low, has it not? Yes, particularly last year.

Flood. 8513. You have not seen a flood in the Darling? There was one the year that I went there, but it was not very high, and it did not last for a great length of time. I think that it lasted for about two months.

Irrigation. 8514. Do you know of any places in your district where irrigation has been carried on on a small scale? Only in gardens; I know of one or two places.

8515. Successfully? Yes, in growing lucerne.

Pumping. 8516. I suppose that in all the cases the water has been pumped from the rivers or the creeks? From the Darling and Murray in all cases.

Yield. 8517. What was the result as far as yield was concerned? I have no certain knowledge of that; I believe about three cuttings of lucerne per year.

Nature of country. 8518. What is the nature of the country generally? It is clay intermixed with sand; rather a light soil I should call it.

8519. Dry soil? Yes.

8520. And of very little use without water? Very little indeed, and it takes a great deal of water too, because it opens out to such a great extent.

Wells. 8521. Do you know of many wells in the district you have been in? Not very many; the only wells that I know much about are those in the bed of the Great Ana-branch of the Darling; they have had to fall back on them during the last two years.

Source. 8522. Have you any idea as to the source of the water in the bed of the ana-branch? It seems to be an underground current—soakage.

8523. Soakage from the river, the mountains in the distance, or the plains? I think that it is water which is working through, and also water finding a lower level probably from the country around; it is local water—there are no hills of any extent to cause soakage from them.

Depth 8524. At what depth is the water found? From 15 to 50 feet.

Quality. 8525. Is it good water? It is brackish—we have used it in camp occasionally; it is not nice water, but it is good for stock.

8526. You do not think that it is simply river water sinking down? I think it is. I think it is water which has soaked through the clay into the sand when the water has been stored in the ana-branch or running through it; there are several dams in the ana-branch which hold water back for a long time. I fancy that a good deal of the water in the wells is that which has soaked down.

8527. What is the nature of the wells away from the river? They are very salty; all those that I have seen are utterly useless.

8528. Is not the water good for stock? No, they have not been able to use it. I am speaking of the south-western part on the west side of the Darling; on the east side there are wells which are used for stock. Mr. T. W. Conolly.

8529. Does the Darling River channel seem to form a boundary between good and bad water? As far as I have been able to see I think so. 25 June, 1885.

8530. Do you know of any large storage basins in the river, the ana-branch, or the neighbouring country? I have prepared a short report on the ana-branch, which I will read:— Storage basins.

WATER CONSERVATION.—Western District of New South Wales.—A few remarks on the natural water system of the great ana-branch of the Darling River, and the means at present adopted for conservation of flood-waters. Great Ana-Branch.

Sir, Sydney, 24 June, 1885.

I have the honor to submit a few remarks on the natural water system of the great ana-branch of the Darling River and the means at present adopted for conservation of flood-waters.

2. The great ana-branch under ordinary conditions is subject to heavy floods about every seven years, and lesser floods every four years; these floods will cause a strong stream from the Darling River through to the Murray River a distance of 250 miles by the course of creek.

3. At a point on the Darling River about 34 miles below Menindie (that is by road), a cutting has been made which increases the flow from the river; for some distance, in fact almost to its junction with Redbank Creek, the watercourse is very shallow; from Urntah Waterhole, near Popio Creek, the channel is well defined, running into deep permanent water near the Murray River, 12 miles below Wentworth.

4. Rather more than 1,000,000 acres of fair pastoral country is watered by present system of conservation carried out by run lessees. By more efficient means the ana-branch could be rendered more permanent, and with its flood-escape channels, which terminate in large depressions, would water twice that area.

5. The following are the chief flood channels and depressions:—

Popio Creek and Lake.

Popilta Creek and Lake.—Popilta Lake discharges into Twin Lake, and thence by a system of watercourses and lakes to Ricketson Lake, about 25 miles back from the ana-branch.

Stony Creek and Nearie Lake.

Nitchie and Milkengay Creek and Lake.

Warrawenia Lake.

There are numerous other watercourses and depressions which by artificial improvements might be utilized.

The deepest lake is Milkengay, in which 12 feet of water has been impounded in deepest part; its extent is about 4 square miles.

Lake Popilta is more extensive (about 28 square miles) but shallower.

Few of these depressions, though valuable for receiving, are retentive; evaporation and percolation into the sub-stratum of sand are great wasters, but the greatest waste is caused by wind washing the water over the margin into large fissures which open in the clay as the water recedes.

6. The greatest distance of the ana-branch from the river Darling is 40 miles; its course is tortuous and fall very slight, so much so that upwards of six weeks ordinarily elapses before the water runs through.

7. There are four dams of chief importance forming reservoirs in the channel and throwing back water into the principal lakes, viz., "New House" (10 miles below Redbank Creek); the "183," near Milkengay Creek; "Bingoo," near Wilpatera (which dams water back nearly 40 miles by course of creek); and the "Ana-branch Station" dam near the Murray River. These dams are from 8 to 12 feet in height.

8. The cutting alluded to in paragraph 3 is made at right angles to the Darling River, and a rise of over 18 feet is required to cause a flow of water into the ana-branch.

It is worth consideration whether by slightly deepening and widening this cutting by rounding off the upper side to draw the current in, the flow of water may be increased without affecting injuriously any other interest.

9. The importance of this water-supply to a large tract of country west of the Lower Darling cannot be over-estimated, and I would respectfully submit the desirability of detail examination by survey and levelling to find to what extent it may be rendered serviceable in watering country where the rainfall is insufficient to rely upon tanks.

I have, &c.,

T. WILLANS CONOLLY,

Government Surveyor, 1st Class.

8531. I suppose that the dams which you refer to are simply earthen dams? Yes. Dams.

8532. Do they stand well? I do not think that any of them have received more than one flood; but there has been a good deal of trouble in the control of the dams—there has been great jealousy on the part of the people lower down. Control of dams.

8533. But the dams have not given way? Not without good cause for it; in one case a dam was blown up, and that resulted in the other dams being carried away; when the dam was replaced it stood the water very well.

8534. Is it good holding ground generally? The channel is. Holding ground.

8535. Is not the surface country good holding ground? Not in all these large depressions—not in the dry lakes; it seems to be so in the Milkengay Lake.

8536. You say that the principal loss of water is through fissures which have been produced by the heat, and on to which the water is flapped? That is what I mean when I say that the ground is not retentive; the cracks or fissures run right up to the water's edge. Loss of water.

8537. If the soil is kept moist it is retentive enough? Fairly so.

8538. Do you think that the ana-branch of the Darling is capable of storing a large quantity of water? Yes, and also, perhaps, some of the billabongs. Storage capacity of Ana-branch.

8539. Why not in the bed of the Darling? I should not like to say that you could store water there, because there is a strong current in the river at times; it all depends upon whether dams could be made strong enough.

8540. But the ground is retentive? While it is wet.

8541. Do you know of any rocky bars across the river? There are one or two that I know of; there is one at Tarangara, between Pooncarie and Wentworth, and another—I do not know that it has a local name—about half-way between that and Wentworth. Rocky bars.

8542. Do you think that if a proper survey were made, other places could be found where water could be diverted out of the river in flood-time and carried over a large extent of country by cutting away the banks or damming the river so as to raise the water? I think so; the country back from the river being very much depressed, there are large areas of it which are much lower than the river banks; quite close to the banks the country is lower; there is scarcely a creek which runs into the river. Depression.

8543. *Mr. Donkin.*] Do you know Lake Victoria? Yes. Lake Victoria.

8544. Is there a large body of water there now? It is never dry.

8545. It is the most permanent lake in your district? Yes.

8546. What depth of water is there in it when it is full? They say 16 feet. Depth.

8547. Is it filled yearly by the overflow of the Murray? Yes; except on one side it is inclosed by high sand-hills.

8548. Can any large body of water be stored there? Yes, every time that the Murray rises it discharges a vast body of water into it. Storage capacity.

8549.

Mr. T. W. Conolly. 25 June, 1885.

8549. Are any means adopted at present to hold it there? There is a little dam around the mouth of the Rufus River which prevents a certain quantity of water from running out of the lake.

8550. Would it be any advantage to the surrounding country to store a large quantity of water there? I do not think that it would be any advantage to spend any further money there; it is an excellent water supply as it is now; the water cannot be got out, on account of the height of the hills; when the lake is full it is about 10 miles long and 6 miles wide in the widest part.

Irrigation.

8551. Do they irrigate at Moorna, and how do they raise the water? Yes, by engines.

8552. That is at the junction of the ana-branch and the Darling? It is about 8 miles below the junction of the ana-branch and the Murray.

8553. Do they find it successful? They have grown lucerne for some years for cows and horses.

8554. To what extent? About an acre—perhaps half an acre.

8555. Why is it so small;—don't they find it remunerative? I cannot say; I think that they only grow sufficient lucerne for their horses and milch cows; there is plenty of water, but I do not think that they have tried to irrigate to any greater extent; they seem to think that it would not pay to irrigate for sheep farming; at any rate it has not been tried.

Supply in Murray and Darling.

8556. I suppose that there is no limit to the quantity of water which they could use? Practically there is no limit; there is an enormous quantity of water both in the Murray and the Darling which could be used; it is not very high to lift as a rule.

Rainfall.

8557. What has been the average rainfall since you have been there? During the last four years about 9 inches; it was a little over 8½ inches last year, and 9·22 the year before; the average during the last sixteen years has been a little over 11¼ inches.

8558. Do they consider 11 inches sufficient for pastoral purposes? They look on it as a good season if the fall is pretty heavy at a time.

Acres per sheep.

8559. *President.*] How many acres are generally allowed to a sheep there? There is a difference of opinion; I think from what they say that the average is about 7 acres; I cannot speak positively on the subject.

8560. Are the lessees generally opposed to outside interference regarding the water question? I do not think so; I have heard those interested in the ana-branch say that it would be a good thing if it were put under more efficient control.

Filling of lower dams.

8561. I suppose that along the line of the ana-branch they, as a rule, object to the water being utilized and stored above? The arrangement now is that the water is allowed to run through before any of the dams are filled; they usually cut through the top dams to allow the water to pass, and when the lower dams are filled, the cuttings in the upper dams are filled in with sandbags and otherwise, and then they are filled.

Water-rights.

8562. Do you find the people expressing the opinion that there is necessity for legislation regarding water rights? I cannot say that I have heard any such opinion expressed, but I think that the feeling is that they wish the rights to be regulated.

8563. From your own observation do you think that it is necessary? I think it is.

8564. Do you think that much silting would take place if the river were dammed? I should not like to express an opinion on that point; certainly the water is very dirty.

Silt.

8565. Do you notice much silting in the dams in the ana-branch? Not much.

Wells.

8566. *Mr. Donkin.*] You do not know of any wells which have been put down from 1,000 to 2,000 feet in the back country? Nothing beyond 120 feet. I think there was one of this depth on Scotia Blocks, in which salt water was struck. I may say that I have traced the Willandra from where it crosses the Lachlan and the Darling district pastoral boundary, so as to know that it is the same watercourse through to Arumpo. I cannot recollect what the distance is. At Arumpo there is a high sand ridge right across the watercourse, and some people hold that it runs down to Gol Gol Lake, but I was never able to trace it with certainty. Then there is Box Creek, which has a very long course, and which runs into Lake Taila or Benanee.

The Willandra.

Box Creek.

8567. Is the Willandra as large a watercourse as the ana-branch of the Darling for storage purposes? I do not think so; besides, it is very flat. It runs through swamps to a very large extent. Box Creek, I think, would make a good place for storing purposes; it gathers a great deal of the local rains.

8568. *Mr. Murray.*] Have you made any observations as to evaporation? I have not.

WEDNESDAY, 8 *JULY*, 1885.

Present:—

MR. DONKIN, J.P., | MR. GIPPS, C.E.,
MR. FRANKLIN, C.E., | MR. LYNE, M.P.,
MR. M'MORDIE, M.I.C.E.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. Edmund Bignell called in and examined:—

Mr. E. Bignell. 8 July, 1885.

8569. *President.*] Where do you reside? On the Widgeegowara Creek, in Southern Queensland.

8570. Have you resided any length of time in Southern Queensland? From 1864 to 1869.

8571. In what part? On Delalah, about 40 miles from Charleville.

8572. Did you own any station there? Yes, Delalah.

8573. Any other? Not at that time. Since that I have had a station near Cunnamulla.

8574. How long have you lived at Widgeegowara? About ten years.

8575. You have experienced all kinds of seasons? All sorts.

Warrego Floods.

8576. Could you give us any description of the Warrego during flood, as to its width? No; I have never been above Burenda.

8577. In flood-time what extent of water is there in the Warrego? The largest flood I ever saw was at Cunnamulla. The width at Cunnamulla would be about 100 to 120 yards. The channel at Cunnamulla is about 100 yards wide now.

Width.

8578. Does not the water spread out much? No, not there.

Mr. E. Bignell. 8 July, 1885.

8579. What width is it at Delalah Station? About the same. The Warrego from Charleville to Cunnamulla has high banks, from Cunnamulla to Baringun the banks get smaller, below Baringun the channel gets gradually smaller, and in times of flood the water spreads over the country until it reaches the Darling River; in February and March generally, but of late years rains have been more uncertain than formerly. During '65, '66, and '67 we had very little rain; the drought then was more severe than the late one, but the country was then lightly stocked.

Rain.

8580. What is the longest time you have known without the usual rains falling? I saw it in 1867, I think. We had no rain for two years to speak of; it was a much worse drought than this.

8581. You have not known a longer term than two years without fair rains? No, I think that will be about the average of the worst seasons. Two years' drought is the worst I have seen.

Country.

8582. What kind of country is it? What part?

8583. At Delalah? All the frontage is salt-bush like the Murrumbidgee, then above that the mulga.

Soil.

8584. What kind of soil is it at Delalah? Some is red chocolate soil and some black soil.

8585. How does the country run towards your present station? I think it is very similar all the way; you get good and bad patches.

Ana-branches.

8586. Are there many ana-branches? No, very few. The creek which I live on has been supplied once by an overflow from the river, but only once to my knowledge.

8587. In what year? Between eight and nine years ago.

8588. What is the source of that creek in ordinary times? Local rains.

8589. Is the country ridgy at all then? No; at the head it is ridgy.

Dams.

8590. I suppose you have dams? Yes, there are dams on the creek.

8591. Are there any dams on the Warrego? I do not think there are any left—they have all been swept away. You may build them, but they are liable to be washed away, even by moderate floods. There is one at Belalie; the water went round the end of the dam in a by-wash, and cut a fresh channel; a succeeding flood cut this new channel bigger than the river itself; when that was stopped the next flood made a further channel outside. The dam is much higher than the channel.

Width of channel.

8592. *Mr. Franklin.*] What is the width of the channel at Delalah? I should say 100 yards.

Depth.

8593. What is the depth to the bed of the river from the bank level? Between Charleville and Cunnamulla, I should think between 25 and 30 feet.

Embankments.

8594. Have you not put earthwork embankments on that creek? I have never done so; others have.

8595. What was the nature of it? Material taken out and built in.

8596. There was no attempt at making a core? No, but I have seen timber dams put in.

Height of dams.

8597. Were those dams carried to a greater height than the bank of the river? Yes, 4 or 5 feet. The water never went over; the water usually goes over the dams, but not over the wings.

Wings.

8598. Were wings carried out from them? Yes, a long way; I know one nearly half a mile in length at Belalie.

8599. Have you seen these dams full and water running round them? Yes, the one I was speaking of.

8600. And they were safe? Yes, and this dam is safe still.

Failures of dams.

8601. You have known these dams to fail—to be carried away by the water? Yes; I have known these dams to become dry from use and evaporation—also carried away by the water.

Banks of river.

8602. What was the cause of the failure? The nature of the soil in the natural bank of the river—the spread and force of the water. The channel is not wide enough when we have a heavy fall of rain to carry the water off; it spreads and cuts out other creeks and channels.

Damming of the Warrego.

8603. Then, in your opinion, if a proper overshot dam could be constructed it would be of great service? If you could make it stand, but my own experience tells me that you could not make it stand. I do not think you could build a dam on the Warrego that would stand. The channel is not big enough to carry away the water—it undermines the wings, and the earth is soft like sugar.

Back-water.

8604. Suppose the overshot dam could be so designed as to prevent erosion, what back-water would that give you if the dam were 12 feet high? I think it would throw the water back 2 or 3 miles; it depends where you put it.

Fall.

8605. Then you think the country falls in that direction about 4 feet in a mile? I think so.

Overshot dams.

8606. Do you know whether any overshot dams have been constructed north of our boundary? No, they are all in New South Wales, on the Belalie station and lower down.

8607. You are acquainted with overshot dams that have been successful? Yes, I have seen them.

Construction.

8608. Can you give a description of their construction? They are piles in the first instance driven in, then fastened with 2-inch sawn slabs.

8609. *Mr. Gipps.*] Are the slabs perpendicular? No, they are horizontal slabs on perpendicular piles.

8610. Is it a single or a double row of piles? It has been constructed with one line of piles, and there is an apron on which the water falls behind the dam. Some have been constructed with double rows of piles and puddled walls between. Then logs are put for the water to fall on.

8611. How are they fixed? I think they are tumbled in any how. An apron runs down from the top of the dam shooting the water off.

8612. You are not aware that they are fixed to any piles that are driven in? I think not.

8613. Then there is a degree of safety in that simple mode of construction? Yes, I think so.

8614. Do you think them preferable to the earth-work dams? Yes, in a stream like the Warrego.

Silt.

8615. *Mr. Franklin.*] Is there much silt? Yes, in all that country.

8616. *President.*] Would that river be affected much if overshot dams were constructed towards the Darling? I think the people down the river would be short of water very often. It would impound the small floods, and prevent the water from going lower down. Of course when a big flood came it would not matter how many dams there were. Sometimes we only get a little fresh, and if there are no dams we get a few months' supply in the river.

Condamine and Maranora.

8617. Which of the Queensland rivers do you consider is the greatest feeder of the Darling? I think most of the water comes from Toowoomba, the main range, the Condamine and the Maranora.

Heads.

8618. I suppose the heads of these rivers in Queensland is ridgy country? Mountainous country.

Formation.

8619. Do you know what kind of rock they contain? Some of them are granite.

8620. Is there much volanic soil at the heads of the rivers? Yes, a good deal.

8621. You have no idea of the proportion? I have not.

Mr. E. Bignell. 8 July, 1885.

8622. I suppose the country is much like our own hilly country? Yes, much like it. The main range is much like your main range, and the timber on it is similar to the timber there.

8623. The Blue Mountain range is a different rock—a sandstone: Do you know whether there is much sandstone at the head of the rivers? I do not think so; I have never been there; I go by what I have heard; I have been only at one or two places on the range.

8624. Could you point out any dividing line between the mountain country and the flat country? No, I am not so well acquainted with the range as to do that. When you get to Dalby, going to Toowoomba, you begin to meet the Darling Downs.

Darling Downs.

8625. But what is it west of Dalby? Flat country.

8626. Then there is not much range country up there? Not till you get to the main ranges.

8627. But the rain falls principally the other way? Yes, but the Toowoomba water comes this way.

8628. And all beyond that the other way? About 2 miles from the top all the water on the western side comes to the Darling, and the rest goes to Brisbane.

Table-land.

8629. But that is more of a table-land than a range? Yes, between Toowoomba and the top of the range.

8630. From Dalby it is a table-land, and there is not much difference between Dalby and Toowoomba? I do not know.

Head of Warrego.

8631. Do you know anything of the ranges at the head of the Warrego? I have never been very high up any of these creeks.

8632. Do you know whether there is any sandstone country? I do not know.

Percolation.

8633. Has it every struck you that there has been any leakage or percolation of the water coming down the Warrego? I think more than half of it disappears.

8634. Could you point out any spots where this takes place? If you go along the river bed it is dry for months, but you can always find water below.

8635. Have you ever noticed any apparent loss of water when it comes down after a flood? No, I have not.

Wells.

8636. Have you had any experience in sinking for underground water? In well-sinking, yes.

Depth.

8637. What depth do you sink? 216 feet is the farthest I have been.

Quality.

8638. Do you get salt water? Yes. The water I am now using is not thoroughly fresh; you can drink it, however. I have a well 25 feet deep, the water from which I have been using for eight or nine years; it is splendid water.

Supply.

8639. What supply is there? Sufficient for the house and the garden. I should think from 1,500 to 2,000 gallons a day; I do not think that it would give more, but we have not tested it.

Source.

8640. Do you suppose that that comes from a local source? Sometimes I think it is drainage, sometimes I think it is a spring. If we have a flood the water does not rise any higher. I have no doubt that if a very large pump was used it could soon be emptied.

8641. *Mr. Gipps.*] Does it ever rise a little before the rains? No; neither water nor the atmosphere seems to have anything to do with it. We get it in a white drift.

8642. *President.*] If it is not affected by the rains would that not show that the water does not come from a local source? I do not know where it comes from.

Salt water.

8643. In sinking wells do you first strike salt water? Yes, as a rule.

8644. And below you find better water? Yes.

Strata.

8645. Do you get it in a drift? Yes, always; that is the good water.

8646. What kind of rock is it? Ironstone.

8647. Have you any sandstone? Sometimes in draining a core we get something resembling sandstone; Mr. Henderson, hydraulic engineer, says it is not real sandstone.

8648. What thickness of rock do you generally go through? In boring that 216 feet we went through 69 feet of alluvial.

8649. On the surface? Yes, and then it was rock.

8650. You got through the rock into water? Yes, through rock into a drift.

8651. What was the direction of the drift? I could not tell.

Rise.

8652. Does the water rise at all? The first day the water was struck it rose 6 feet over the surface. At sundown it had lowered down to the top of the pipe, and the next day to 40 feet from the surface. It has remained there ever since.*

8653. *Mr. Gipps.*] You never tried boring it again? No.

8654. Does not the fact of the water rising up and going down again indicate that something may have rushed in and stopped it? I do not think so. We have got the stand-pipe in the shaft. We send a man down and he feels about till he finds a pipe and he puts a plug in, then we pump the shaft dry.

Quality of water.

8655. *President.*] Is that good water? Very good. I had 22,000 sheep, fifty cattle, and twenty-six horses there.

Supply.

8656. I suppose that did not exhaust it? It never lowered it.

8657. You have wells at certain distances? If I put up a paddock I estimate where I ought to have wells to suit the sheep; wherever I decide upon I put the well down, and chance whether I shall get the water—there are no indications.

8658. In this particular well you went through 60 feet of alluvial? I bored down with a diamond drill, then tube it.

Tubing.

8659. Do you ever try to tube to the surface after the water has come into the well? Yes; it will never rise in the shaft.

8660. The effect is the same in all these wells? Yes.

8661. In the first instance the water comes over your heads? No; in none of the others did it ever rise to the surface.

8662. They do not rise? Yes; in every well I have the water is about 40 feet.

Source.

8663. What is your impression as to the cause of the water sinking in the manner you have described after having come up with so much force? I do not think the level of the source is high enough to make it rise to the surface.

8664. But it did when you first struck it? I think that was through its being suddenly let loose. My impression is that the water comes from the Rockhampton Range. 8665.

* Note (*on revision*):—Before commencing to bore we sink a shaft through the alluvial to the rock, then bore from the middle of the shaft, and the stand-pipe remains there. We send a man down the shaft occasionally; when he reaches the pipe he puts a plug in it, which remains till all the water is pumped out of the shaft; when the plug is removed we know the flow of water.—E.B

Mr. E. Bignell. 8 July, 1885.

8665. You think that the water in the five wells is from other sources? Yes.
8666. Have you sunk deeper to try to get artesian water? No; but I believe there is any quantity of water.
8667. All these wells are on the lower run? Yes; on Widgeegowara.
8668. Have you any on the Delalah Run? No; Delalah has not been mine for several years past.
8669. Have you ever tried to get water on that run? No.
8670. Do you know of any outcrop of sandstone? No.
8671. The natural theory would be that, so far as the rock you have spoken of continues, you will get the water underneath? Yes. As soon as I saw the core I was sure that I should find water, because it was so similar to the core in the first well.
8672. Do you find that the water extends any distance across the country? No; the wells are in different positions.
8673. About what breadth of country do these wells cover, east and west? A strip about 5 miles across.
8674. And you have such confidence in finding water that you simply select the most suitable spot and sink? Yes.
8675. Have you failed in any case? I have got water in all cases—in some not so good as in others.
8676. I suppose you have no theory as to the water leaking from the Warrego? No, none at all.

Mud-springs.

8677. Are there any mud-springs? Not in my country.
8678. Do you know of any? Yes; there is the Tago, south-east of the Widgeegowara Creek, and near the border of New South Wales; there is another called Towery, 4 or 5 miles from Tago.
8679. Do you know from hearsay whether there are any number of springs anywhere east or west of the Warrego? On the Paroo there are plenty; you get a number in one patch; then you go a long way before you get another. The Tago is 9 or 10 acres of springs. At Towery they put down an auger right through the centre of the springs, and tube, and they have an artesian supply; it rises about 15 feet above the surface.
8680. What supply is there? I think about 3,000 gallons a day; there may be more, but I do not think there is.
8681. There is a supply of about 120 gallons an hour? I should think that is about it.

The Paroo.

8682. Do you know much about the Paroo country near the ranges? I have been on the top of the ranges.
8683. What is the nature of the country? Rocky and ridgy, with mulga timber.
8684. What kind of rock is it? Rotten ironstone.
8685. Have you had any experience of water-sinking there? I never tried it; in some places people have wells there.
8686. Have they any artesian supply? No.

The Warrego natural basins.

8687. *Mr. Franklin.*] Do you know if any line of action could be taken for the conservation of water on the lower part of the Warrego, are there any natural basins or billabongs? No, Nature has given you nothing.

Depressions.

8688. No depressions? There are some, but not sufficient to do any good.

Overshot dams.

8689. Do you think it would influence the stream lower down if some overshot dams were constructed by which we might regulate from behind the supply for the lower part of the country; if overshot dams were constructed with sluices fixed in them, might we not fill them in times of flood? Immediately after a flood there is plenty of water, but if you kept the water there it would disappear to a certain level.
8690. By evaporation? By passing underneath. If you had 20 feet of water at the head of your dam it would soon fall to the same level that it is at now; I think it has some way of escape.
8691. If we were to make substantial dams the water would subside by evaporation and soakage? I think so.
8692. As a matter of fact, you cannot keep permanent water now? Only in the natural bed of the stream. If you raised the water 1 foot above its present level I believe it would go away; I think there are leakages in the soil.
8693. There are no natural lakes there that might be enlarged? No, none.

Diversion.

8694. *President.*] Do you know of any place where the water could be diverted by means of a canal or an embankment into a depression away from the river? It was my intention before I commenced boring to carry the water into our own creek, and we had the levels taken by a practical man, but found that we could not do it.
8695. Does the country rise? Yes.

Evaporation.

8696. Have you had any experience as to the evaporation in that part of the country? Only in a casual way.
8697. You can give no reliable information on the subject? No.
8698. I think from what you said just now you may be able to give some information as to water being diverted from the various channels into depressions? On the Warrego?
8699. Yes? Yes, but I do not thoroughly know the lower part of the Warrego.

Current.

8700. *Mr. Donkin.*] Is the current very strong in the Warrego in times of flood? No, not very rapid; it is a sluggish stream. The biggest flood I ever remember I think took three weeks to come from Charleville to Cunnamulla.
8701. *President.*] What distance is that? It will be 120 miles.
8702. In coming that distance I suppose there would be very great loss? It had to fill up all the holes and billabongs.
8703. *Mr. Donkin.*] You said it did not spread much? It did not.
8704. But it spread at Cunnamulla Creek? Yes.

Cost of wells.

8705. Speaking of diamond drills, what do you calculate the wells have cost you;—the deepest you said was 216 feet? It depends upon what point you commence with your estimate.
8706. What do you consider to be the cost per foot, taking the average? I can tell you to a shilling what the cost will be after the machinery is erected. There is the cost of one engineer boring for fifteen days, at £5 5s. a week and his rations—say altogether £6 a week. A man to drive the engine, £2 a week and his rations. Two men are kept to draw the rods and lower them; their wages would be 30s. a week each and rations; say £4 altogether. Then a cook at 25s. a week and rations, and a man to draw water and feed the engine—sometimes two are employed—it depends upon the distance you have to draw the water. We had excavations made to catch water. I put down 25s. a week for draught horses, making £2 with rations, and you may put down £4 for firewood for the whole work.

8707.

Mr. E. Bignell. 8 July, 1885.

8707. I want to ascertain what it would cost to contract for the sinking of a well? You have to allow for two horses, and you could not get them under £1 a day, but you would not have to pay for the driver. £1 a day for the horses is the best way to get at it.

8708. There is the tubing and the carriage? Well, it depends upon what sized bore you use; ours is 5-inch bore, Glasgow tubing.

8709. What is the width of your well? 5 feet by 2 feet 6 inches.

8710. What is the bore? 5 inches. It is more, but it is done with a 5-inch tube. That will cost 4s. a foot. I paid 3s. 6d. for it.

8711. That is £27 a week for labour, £43 for tubing, £4 for wood, and then there is your own superintendence? Yes.

8712. That will be about £35 a week as the cost of the work? Yes, but there is 60 feet to come off for alluvial.

8713. *President.*] That is about £113 for 156 feet of sinking with the diamond drill?

8714. *Mr. Franklin.*] Could you not submit an appendix giving all particulars? If you are not in a hurry you could obtain all the particulars from Mr. Henderson—he will give you the whole thing.

8715. What would you do it for per foot if you were employed to sink a well? You would have to take into consideration the wear and tear of plant.

8716. *Mr. Donkin.*] Would you do it for £1 a foot? I think that was the offer, but it was to bore on my own land.

8717. *President.*] If a person goes in for sinking wells he will have his plant there, and the interest on the cost of the plant has to be considered; to charge every well with the cost of bringing the plant from Brisbane or Sydney would not be fair;—would not £1 a foot be a fair average? In a country like ours he would have to shift his plant very often.

8718. Do you think that if a contractor undertook to sink for artesian water, he could do it cheaper than sinking for the shallow? Yes, you can sink 2,000 feet much cheaper than you can sink 500 feet, because you do not require to remove your machinery. The moving of the machinery involves a large expense. There is no difficulty in boring through rock; 5 feet of drift is worse than 50 feet of rock.

8719. *President.*] The Government charge £10 a week for wear and tear, and this amount with payment, or three men and the other expenses, would make £26 a week.

Rainfall. 8720. *Mr. Gipps.*] What is the general character of the rainfall? It comes in heavy storms—thunder-storms as a rule; it comes from the west.

Floods. 8721. Does it produce floods instantly? Next morning.

8722. High floods? It would depend entirely upon the state of the ground and the character of the rain. No fall of less than 3 inches in our district will cause a flood, and it must come all at once; if it takes a week or a fortnight to fall it will be of little good for supplying water.

Dews. 8723. Have you any dews? Very seldom; we may have occasionally just after a rain.

Winds. 8724. What are the prevalent winds? They come chiefly from the westward.

8725. Summer and winter? Yes, but we get very little wind there at all. I purchased a windmill and I have seen it stand for months without revolving.

Tanks. 8726. Have you any tanks? I have twelve or fifteen large ones.

8727. Of what dimensions? 8,000 to 15,000 yards. I have one about 16,000 yards.

Depth. 8728. What depth? 14 feet 8 inches is about our deepest.

8729. For what purposes do you use them? For sheep and cattle.

Supply. 8730. How many sheep and cattle do you water in the largest one? I think 6,000 sheep is plenty. It is according to the paddock. It does not matter how large the tank is, the grass will not last as long as the water if you put more than that number of sheep on it.

8731. Do the tanks ever get empty? Yes, very often.

8732. The largest one? Yes.

8733. In how many months? I should not like to be compelled to put more than 6,500 or 7,000 sheep on a tank. The last 2 feet off the bottom is lost after the first season or two.

Silt. 8734. Then you have no silt tank? Yes, but a certain amount of silt will always come in off the batter.

Holding ground. 8735. Is it good holding ground? Very good.

Evaporation. 8736. Do you lose much by evaporation? Very much, I think.

8737. You have never measured it? No.

Height of flood 8738. What was the height of the highest flood in the Warrego? I know that at a station just past Cunnamulla the water has been right up to the verandah. It must have been 50 feet high.

Current. 8739. Is the current very rapid? No.

Witness: I can get you from the station a full account of the cost of plant, and the cost of boring and everything.

President: Your evidence will be sent to you, and those particulars can be added.

Witness: Through the use of the drill I have saved my sheep during the late drought and have had a good lambing, whilst other stations have lost heavily. We have from nine to ten months without a drop of surface water on the land at all.

THURSDAY, 9 JULY, 1885.

Present:—

MR. DONKIN, J.P., | MR. FRANKLIN, C.E.,
MR. GIPPS, C.E., | MR. M'MORDIE, M.I.C.E.,
MR. MURRAY, M.P.

F. A. FRANKLIN, ESQ., C.E., IN THE CHAIR.

Mr. W. J. Hanna called in and examined:—

Mr. W. J. Hanna. 9 July, 1885.

8740. *Chairman.*] You are the Road Superintendent of the North-western District? Of the Western District.

8741. Your district is bisected by the 144th meridian of longitude, is it not? Yes.

8742. That goes nearly through Wilcannia? About half a degree to the east of Wilcannia.

Mr. W. J. Hanna. 9 July, 1885.

8743. In seeking information from you how far may we safely go to the eastward of Wilcannia up the Darling River? I have not been much to the eastward of Wilcannia. Information so far has been obtained when travelling over the roads in my charge.
8744. To what distance up the river above Wilcannia? I have not been far up the river—about 20 miles I suppose.
8745. Below that I suppose you are intimately acquainted with the features of the country, both on the river and in the back of the country? No, not in the back country.
8746. In which direction have you roads under your supervision to the westward of Wilcannia? From Wilcannia to Thakaringa.
8747. How long have you been resident in that part of the country as road superintendent? Two years.
8748. What have the seasons been during those two years—have they been ordinary seasons, or seasons of great drought? The summer of '83–'84 was one of the worst that has occurred within the memory of the oldest inhabitant, causing enormous losses of stock throughout the district. From June, '84, till January, '85, the rainfall, although light, was sufficient to prevent further loss. Heavy rain on the latter date filled all tanks and natural waterholes, producing abundance of feed from the Queensland border to about 20 miles below Menindie. Seasons.
8749. What was the state of the roads during that time? During the summer before last they were almost impassable, owing to want of feed and water. Roads.
8750. The great traffic to the Silverton mines had not commenced then? Not at that time; it is only during the last twelve or eighteen months that the traffic has increased so much. Traffic.
8751. And it has increased to a very great extent I suppose? Yes.
8752. What are the natural sources of water-supply on the road between Wilcannia and Silverton? There are no natural supplies worth mentioning except at Stephens and Yancowinna Creeks. The former, which is soakage-water, might be considered permanent for wheel traffic, and for the same purpose the waterhole in Yancowinna Creek would last from eight to nine months in a good season. Water supply.
8753. How far is that from Wilcannia? About 150 miles.
8754. What means have been adopted by the Government to provide water along the road for the purpose of meeting the requirements of the increased traffic? The Mines Department is boring at Netallie, Lewis's Tank, and other places. Borings.
8755. At what intervals along the road are they proposing to provide a permanent supply of water? I do not know.
8756. In the meantime what means are resorted to for providing water for stock and travellers? None beyond what I have mentioned. Besides Stephens and Yancowinna Creeks referred to there is permanent water at Lewis's Tanks, 8 miles west of Calker's Well, but that is private property. Lewis's Tanks.
8757. How is the water obtained;—is there a dam in the Yancowinna Creek? No; there is a natural waterhole in the bed of the creek. The Mines Department is boring at Nettalie, Salt-bush Flat, and Lewis's Tank. Waterhole.
8758. Do you know whether any successful results have been met with in the bores? Salt water was struck in the first bore, near Netallie, but they have gone through it and are now in hope of getting good water. The depth I think is over 300 feet. Salt water.
8759. None of the works are complete yet? None.
8760. *Mr. Gipps.*] Are they boring through rock or through the ordinary drift? Through drift in the Netallie bore. They have got stock water at Salt-bush Flat, about 20 miles from Wilcannia. Strata.
8761. *Chairman.*] Is the road between Wilcannia and Silverton bisected by any well-defined course at all? Yancowinna and Stephens Creeks are the principal ones, but there are numerous watercourses of more or less importance.
8762. Are you aware whether any works have been constructed on those creeks to retain the storm-water? There are none. Storm-water.
8763. Has it ever occurred to you whether it would be possible to make dams for the storage of water in those creeks? Stephens Creek I consider is too shallow, and the bed too sandy. In Yancowinna Creek, close to the road, there is a site for a dam, but the risk from floods would be too great. Storage in creeks.
8764. The risk to an earthwork dam? Yes.
8765. What is the width and what the depth of the creek? Approximate measurements at the place I allude to are: south bank, 12 feet; north bank, 8 feet; top width, 50 feet; bottom width, 13 feet. Yancowinna Creek.
8766. Supposing that there is a slight fall in the creek, to what distance would a 10-feet over-shot dam back the water? About 120 chains. Fall.
8767. You do not know whether any steps have been taken, or suggestions made, for damming those creeks you have mentioned? I am not aware that anything has been done. In a report furnished to the Engineer-in-Chief for Roads with reference to water supply between Wilcannia and Thackaringa, I recommended a well at Yancowinna Creek in preference to a dam, as there is a very fair prospect of obtaining good stock water by sinking. Damming of creeks.
8768. The well you proposed would be an ordinary well I suppose? Yes, with tank and troughing. Well
8769. Do you know whether your report has been favourably received? No; the watering of the road was taken over shortly afterwards by the Mines Department, and sites now adopted were chosen, I presume, by their officers.
8770. Can you give us any information about other parts of that road, where it has occurred to you that works might be carried out to conserve water for keeping open the communication with the Silverton mines? The country, on the whole, is well adapted for the conservation of surface water. There are good and extensive catchment areas, most of which will shed a large proportion of rainfall. At Yancowinna Creek and Salt-bush Flat tank sites could also be found, but there being a good prospect of obtaining stock water by sinking, and as the country at these places is rather flat, wells were recommended. For other stages I would be in favour of tanks; that is, up to Mount Gipps, which was as far as I was able to report. It was during the very dry summer, and I was not able to get right through. Conservation of surface water.
8771. From your general knowledge of the lower part of the Darling can you say in which way the drainage lines tend to the northward and westward of the river? I cannot.
8772. Have you ever observed that the bank of the river is higher than the country away to the northward and westward? Yes, I have noticed that in several places, and also that one bank is nearly always higher than the other. Darling banks.

Mr. W. J. Hanna. 9 July, 1885.

8773. But have you any particular reason for knowing that there is a fall away of drainage water from floods into the country west of the Darling? Yes, and also on the east side; the ana-branches and lakes into which water flows from the river, when in flood, clearly prove this.

Natural depressions.

8774. And do you know of any large natural depressions, such as lakes, or dry beds of lakes, on the banks of the river? Yes, a large number.

Lakes.

8775. How frequently do they occur below Wilcannia, and at what distance? The following are the approximate distances in miles, from Wilcannia, of some of the principal lakes that are filled by the river when in flood:—Woytchugga, 5; Matta, 70; Teryaweynya, 66; Byyi, 79; Pamamaroo, 82; Lakes Cawndilla and Tandou, about 8 and 18 miles respectively from Menindie. As the river falls the flood-waters recede, leaving behind a comparatively small body of water, which, in some cases, the evaporation of a summer and absorption will completely dry up.

Diversion from lakes.

8776. What would be the advantage if the flood-waters could be retained in those lakes as reservoirs—could the water be utilized? It could be conducted to other parts of the country by means of drains or canals.

8777. Would the natural fall of the country permit of the distribution of the water by gravitation? I do not think the flood-water could be profitably used for irrigation purposes, but it could be drawn from the lakes into natural depressions, creeks, and billabongs.

8778. But taking the natural fall of the river, if you stored the water to the highest point possible in the lakes, could it not be discharged on the line of the river? Yes, that would be quite practicable, and productive of much good, if the supply from the river could be kept up; but a high flood seldom occurs, and does not remain more than two or three days stationary, so that the inland current would soon be cut off.

8779. By decreasing the fall we have in the river bed, we could discharge that water into the lower country towards the counties of Windeyer and Tara, towards Wentworth? Yes, but to maintain a continuous supply it would be necessary, I think, to put in a lock or weir, or tap the river at a much higher level.

Area of lakes.

8780. I believe those lakes are of very large area? Very large, but generally speaking they are not very deep; some of them contain no water except while the river is in flood.

8781. And you have not had your attention specially directed to the subject of watering except on the line of route? In March last I received a letter from the Commissioner and Engineer-in-Chief for Roads, asking me to collect as much information as possible with reference to the flow and storage of flood-waters throughout the district, and, if my ordinary duties permitted, to inspect some of the lakes and other places where important information could be obtained. This report I have not yet been able to furnish, owing to pressure of work.

Country from Wilcannia to Wentworth.

8782. Are you acquainted with the country on the southern side of the river Darling? Not personally, as my travels are confined to the roads. Along the course of the river from Wilcannia to Wentworth the country consists of what is known as the "red soil" and "black soil," with occasional sand-hills.

8783. But I suppose you know the Tallywalka? Yes.

The Tallywalka.

8784. The Tallywalka is rather large in area: what is its general condition? It is always dry except in flood-time.

8785. In flood-time I suppose it is fully charged with flood-water, which recedes with the receding flood-waters of the river? Yes; when the river is at a height of 28 feet at Wilcannia the water will flow in the Tallywalka Creek.

8786. And it eventually discharges into the Darling again? It would if the water remained at a high level for a sufficient length of time, but I believe there is a dam across the Tallywalka Creek which diverts the water from the main channel southward for the purpose of filling the Teryaweynya and other lakes. When these lakes are full, or the water rises to a fixed height, it is, by virtue of an agreement made by those interested in the work, allowed to flow past and discharge into the river about 5 miles below Menindie.

Terraweynya Lake.

8787. What is the natural drainage of that water at the overflow to the Terraweynya Lake—in which direction would it naturally flow from there? I cannot say; I have not been down there.

8788. Do you know whether, when that lake is filled, the water is considered permanent? It is not permanent, but would last for four or five years.

8789. Is it shallow? Yes, in its present state, but from what I have heard I am inclined to think that, by a comparatively small expenditure, the storage capacity here and in some other lakes can be largely increased. All the water that came down in the last flood, which was the highest that has been known there for some time, never went past the dam.

Works.

8790. As the fall of the Tallywalka appears to be in the same ratio as that of the country in which it is situated, do you think it is possible to construct works by means of which the water might be retained in time of flood and utilized for keeping the lakes permanently filled, advantage being taken of the natural course of the creek as a canal? Works could be easily constructed in the creek to retain the flood-water, but the quantity of water thus impounded would be of very little service in keeping the lakes permanently filled, owing to their immense surface area. If the fall at the head of Tallywalka Creek would admit of being lowered, a low weir could be put across the river, to take advantage of freshes that frequently occur, but from which no benefit is derived. In connection with this I think it is worth considering the advisability of constructing a lock at Wilcannia, where there is a rock foundation on one side, stretching nearly across the bed of the river. On this subject, however, I cannot at present enter, but shall forward further information, if required, after inspecting.

8791. But in any case there would have to be regulating headworks to admit and impound the water? Yes, especially when the lakes and river-bed at inlet are on the same level or nearly so.

8792. Then, of course, the Tallywalka would have to be treated by levels to ascertain in what way the water should be dammed at intervals, so as to keep it constantly in the creeks? Yes.

8793. You are not aware of anything that has ever been done to test the possibility of doing that? Nothing has been done that I am aware of.

8794. I suppose you are not aware of the fall of the Darling per mile? No, but I believe it is accurately known.

8795. There is some proposal at Wilcannia for putting low crest weirs in the Darling? Yes.

Weirs in the Darling.

8796. Have you ever formed an opinion as to what the result would be if overshot weirs were built at a low level in the Darling? The river of course would be unnavigable, but the water which now flows into the ocean would be diverted through other channels to fill the lakes already referred to with a permanent supply of water, and increase the value of a large area of country.

8797.

Mr. W. J. Hanna. 9 July, 1885.

8797. *Mr. Donkin.*] Do steamers run up to Wilcannia now? Yes; there were twenty-seven up on the last rise, but the river at the present time is not more than a foot or 18 inches deep, and therefore unnavigable throughout its whole course. Flood-water from the Murray backs up the Darling about 20 miles.

8798. *Chairman.*] It is proposed, I believe, to put locks in the river? Yes; a company was formed some time ago for that purpose.

Loss in locks.

8799. Do you know if any calculation has ever been made as to the waste of water in taking the steamers through the locks, and as to how the supply can be kept up? Not that I am aware of; I presume the loss would be made up by the water coming down.

8800. Assuming that there is always a sufficient quantity running? Yes.

8801. And do you think that a sufficient quantity of water comes down the Darling at Wilcannia to make good the loss that would occur if the navigation were kept open, taking into consideration the length of the steamers and barges and the distance between the lock gates? There might not be sufficient to make up the loss in a very dry season.

8802. Without provision being made higher up the river to keep up the supply? Yes. Taking traffic into account, the cost of impounding water for this purpose would be too expensive. With carefully constructed locks it could be safely calculated, I think, that the river would be navigable at least nine months in the year.

8803. But you know there would be a great slip of water at the lower lock if the river was constantly used for navigation purposes? Yes. The river being closed for two or three months in the year would cause very little inconvenience, but I think it is doubtful if such would be the case unless during a drought or exceptionally bad season.

Irrigation and navigation.

8804. By which means do you think the interests and progress of the Colony would be best advanced—by conserving the water for distribution over the country for irrigation and other purposes, or by carrying out works for keeping the river open for navigation? Most decidedly for irrigation, but I would add that locks would suit both purposes.

Railway.

8805. And a railway would answer all the purposes of communication with Wilcannia? Yes. That, however, is an opinion that very few will indorse in the Wilcannia district.

8806. But it would be most beneficial to the country at large? It would.

The Paroo.

8807. Do you know the Paroo River? I have travelled up and down it occasionally, but have not spent any time in examining it.

8808. You have not had time to study it throughout its course from the borders of Queensland? No.

8809. Do you know its terminal point where it ceases to be a defined creek or river? It is very hard to say where it ceases; except after heavy rains it is never running.

Dams.

8810. What means have been adopted by the lessees there to retain the water for stock purposes? They have made some dams above Wanaaring, but I have not seen them.

Water flowing up the Paroo. Site for dam.

8811. Then you do not know the nature of the country, so as to say whether it is possible to dam the lower part of the Paroo and convey the water some distance from the river? When the river at Wilcannia rises to 30 feet the flood-water will flow up the Paroo channel about 50 miles, filling Copago Lake, which is approximately $2\frac{1}{2}$ by $1\frac{1}{2}$ miles, and other natural depressions. About 9 miles from Wilcannia there seems to be a good site for a dam. The work would be comparatively inexpensive, and conserve a large body of water. This dam could be constructed with sluices to admit the flood-water from the river and prevent its return. It would also impound the flood-water coming down the Paroo, and thus suit a double purpose. From this and similar reservoirs I am inclined to think that the water can be drawn (by gravitation) for storage in other places.

Outlet of the Paroo.

8812. Then the Paroo, where it enters the Darling, is a well-defined creek: there is no evidence of that on the map, which shows that the Paroo ends in a large swamp? There is a creek which enters the river, and into which I think the flood-water from the Paroo would flow, but it never did so until the last flood, which was the highest that has ever been known. The creek which enters the Darling a few miles above Wilcannia may be set down as the outlet of the Paroo River.

Paroo flow.

8813. *Mr. Gipps.*] Does the Paroo ever flow into the Darling in a continuous stream? The Paroo was never known to flow into the Darling prior to the flood in January last.

8814. Did it do so then? Yes.

Kalyanka Creek.

8815. *Mr. Donkin.*] Is that the Kalyanka Creek? Yes.

8816. *Chairman.*] That creek you take to be the outlet of the Paroo to the river Darling? I believe it is. The water was never known to flow there before.

8817. The water simply recedes with the flood, and no attempt is made to check it or conserve it? None.

Cobham, Yantara and Salt Lakes.

8818. Have you made any observations with regard to Cobham Lake, the Yantara and Salt Lakes, as to their general condition in dry weather? Yes; these lakes were quite dry before the January flood. Cobham Lake contains at present about 26 feet of water. There are four or five creeks flowing into it, but, so far as I am aware, it has no outlet—it seems to be a basin. Cobham, Yantara, and Salt Lakes are all full.

8819. Why is the Salt Lake so called;—does it at any time become saline? Yes; when the water falls to a depth of about a foot it becomes quite salt.

8820. Then I suppose it is not suitable for stock or any other purpose? Not then.

Cobham Lake extent.

8821. What is the extent of the Cobham Lake? From 1,600 to 1,700 acres. During the summer of 1883–4 there was a radius of 20 or 30 feet on north side of the lake within which good water, fit for domestic use, was found at a depth of about 10 feet, but beyond that the water was as salt as the sea.

8822. What is about the average depth? The deepest part is about 26 feet.

8823. What would you take the average to be? From 15 to 17 feet.

8824. So that we may calculate the area you have given by about 15 feet of depth for the contents of the water? Yes.

8825. Can the water be discharged from the lake by gravitation? I do not think so; there is no outlet.

8826. Do you think that if extended levels were taken in the line of the Darling the increasing fall of the ground might give a discharge from that body of water? I do not think water can be taken from the lake by gravitation, and, if practicable, it is very doubtful if that course would be judicious. The supply is too limited, the locality unsuitable, and the ground too porous. The amount required for constructing works to drain water from the lake (if found practicable) for distribution would be better expended on storage works.

Mr. W. J. Hanna. 9 July, 1885.

8827. How far is the Cobham Lake situated back from the river? About 130 miles from Wilcannia in a direct line, or 150 by road.

8828. In the line of the river? That would be about its distance from the river. The road is at about right angles to the river.

8829. And the water is at present serviceable for people travelling on the road? Yes; and will be for four years.

8830. You consider that it will be permanent for four years? Yes.

8831. *Mr. M'Mordie.*] Do you mean that it would be permanent for four years without any rainfall during the period? I am allowing for an ordinary rainfall—say 6 to 7 inches of rain in the year.

Yantara Lake. 8832. *Chairman.*] Are the Yantara and Salt Lakes also of considerable magnitude? Yes, they are both large; the former covers an area of 8,000 to 9,000 acres.

8833. And of great depth? I cannot say what depth.

Cobham Lake. 8834. *Mr. Donkin.*] Was Cobham Lake dry the summer before last? Yes; it was dry for years.

8835. *Chairman.*] And it is an unusual thing to find it so fully charged with water? Yes.

8836. You do not know whether it has ever been considered practicable to use the water of the lake by means of gravitation? I do not think it has ever been tried—I do not think it could be done; the lake is surrounded by high ground, in the lowest part about 20 feet above the bed of the lake.

8837. *Mr. Gipps.*] Is there any drainage channel from the lake? None that I am aware of.

Watershed. 8838. What is its watershed? I cannot say how far the watershed extends. The creeks that flow into Cobham Lake are Mount Brown, Evelyn, Yarramurtie, Wonaminta, and Burr Creeks.

8839. *Chairman.*] Then you are not sufficiently acquainted with the locality to say whether it is possible to find a depressed part in the surrounding ridges where, by a moderate cutting, the water could be taken through? No, I have not examined the country surrounding the lake with this object, and cannot therefore say definitely that the distribution of water from the lake by gravitation is impossible, but in my opinion the advantages to be gained would not justify the expenditure.

Lakes filled from Darling. 8840. Do you think it would be possible, by raising the head of the Darling, to keep the lakes constantly replenished by bringing the water over the surface of the country? I do not think you could bring the water from the Darling into those lakes.

8841. *Mr. Donkin.*] The fall is towards the Darling, is it not? I think the fall from Cobham would be to the Darling—say about Wilcannia.

8842. The Paroo water could not be diverted in that direction, could it? I do not think so. If any water could be diverted into these lakes it would be from the Paroo, but I am doubtful if it could be.

8843. Do you know what height Cobham Lake is above the sea? No.

Levels. 8844. *Chairman.*] And you have no road levels connecting the Darling with Cobham Lake? No.

8845. *Mr. Donkin.*] Have any levels ever been taken there from the Darling? I do not think so.

8846. You do not take heights with the aneroid? No, I have never found it necessary.

8847. *Mr. M'Mordie.*] Have you any road levels through you district? None. Macadamized roads, unless in a few exceptional places, are not required—simply clearing; it is all level country.

Conservation in billabongs. 8848. *Chairman.*] In the part of the Darling that you are best acquainted with do you know if there are many old points of the river, such as billabongs or depressions, preserving something like the sectional area of the river, but now grassed over? I have observed some below Menindie.

8849. Are they of any great extent? Not very great. I have only seen them when passing in the coach.

8850. Did it ever occur to you that the flood-waters might be retained in them with advantage? Oh yes, the flood-water could be stored by constructing a dam with sluices at the entrance to the Darling, or a dam at the outlet and a dam with sluices at the inlet, as the case might be.

8851. Do you think that they are of such extent and of such frequent occurrence as to materially ease the floods? No, not to any extent.

8852. Have you formed any opinion at all as to how the storage in those lakes immediately on the banks of the river might be increased, by raising levées or by any other means? Dams with sluices or similar regulating works would, I think, be found to be the most suitable. The storage capacity in some cases could probably be further increased as proposed, but this course would check the outflow to other reservoirs, or necessitate the construction of additional works.

8853. That is to regulate the water flowing in from the river and to shut it in? Yes, that would be quite practicable in many creeks.

Benefits. 8854. For whose benefit would the water be conserved? It would be a benefit to the Colony at large, as the country would be permanently improved. The carrying capability being increased, the lessees could afford to pay a corresponding increase in rental.

Height of floods at lakes. 8855. Do you know what is the relative height of an ordinary flood above the present level of these lakes—could a greater height be obtained by building a continuous levée around them? I could not say. I have never seen any of them, but the openings to the river would be very suitable places for works to conserve water.

8856. And you believe that by a system of locking by sluices the water could be retained in most of those depressions and lakes so as to be of benefit to the country? Yes, and inexpensive when compared with the benefits to be obtained.

Building material. 8857. What kind of material would be best for that part of the country in the absence of stone, for the construction of those works? Timber. I do not think the cost would exceed 25s. per 100 superficial feet if brought up by water.

8858. You would depend on water-carried timber for any works of that kind? Yes.

8859. *Mr. Murray.*] That is sawn timber? Yes.

8860. Would not rough squared timber be as suitable? Hewn timber would be equally suitable for the greater portion of these works, but it is doubtful if it would be less expensive, owing to the cost of labour. In some parts of the district for timber locally sawn £4 per hundred has been paid.

River register at Wilcannia. 8861. *Chairman.*] Have you made any observations at Wilcannia as to the height of the river at all seasons of the year? I have not, but I think there is a register kept.

8862. Do you think it is reliable? I believe it is.

8863. Do you know of any parts of the bed of the Darling, in the vicinity of Wilcannia, where an overshot weir could be built—any sort of strata that is different from the general strata of that country? Yes, there

Bar at Wilcannia. is a bar of rock at Wilcannia which stretches nearly across the river from the Wilcannia side.

8864. What do you estimate its angle of dip to be? It is nearly horizontal.

8865. *Mr. Gipps.*] It is bed-rock, is it not? Yes; it would be about 25 or 30 feet below the surface. Mr. W. J. Hanna.
8866. What is the character of the rock? I have not been down to it.
8867. *Chairman.*] Have you formed any opinion as to the hydraulic discharge—that is, the proportion of a 3-inch or inch rainfall that would discharge into the river after an ordinary dry season? That is a difficult question to answer—it depends entirely on how the rain falls; for instance, you might have 6 inches of rain in the year, but it might fall in such a way that very little, if any, would reach the river. 9 July, 1885. Discharge.
8868. Take a steady downpour for twenty-four hours during which you get 6 inches of rain, making allowance for the absorption of that part of the country? From a fall like that I think about 30 per cent. would reach the river.
8869. What is the nature of the country? Black and red soil, and occasionally sand-ridges. Country.
8870. Have you ever noticed particularly after an inch and a half fall of rain whether all the creeks were running? An inch of rain will make all creeks (excepting the larger ones) run. Creeks running.
8871. And how long a time would elapse before the creeks subsided again? I could not say; I have not taken particular notice.
8872. *Mr. Gipps.*] What is the area of Lake Woytchugga—one of the lakes which could be filled from the river? I could not say. Lake Woytchugga.
8873. Can you give it approximately? The approximate area might be set down at 1,500 acres. Area.
8874. What is about the average depth? I do not think it would be more than 5 or 6 feet. The depth depends entirely upon height of flood. It is dry again now—the water that was put in by the last flood has disappeared. Depth.
8875. What was the date of the last flood? From the 21st to the 24th of January, 1885. Flood.
8876. Does the river Darling actually flow into the lake at flood-time? Yes.
8877. Is there any drainage off? Yes, into the river; the fall from the lake is toward the river. Drainage.
8878. What is the character of the surrounding country—is it high land all round? The country surrounding Woytchugga Lake is of a sandy nature. I do not think the water could be drawn from the lake for storage elsewhere. Country.
8879. Is it much higher than the bed of the lake? Not much.
8880. Do you think it would be possible to retain the water in the lake? Yes, at or near its junction with the river. Storage.
8881. By what means? A dam and sluice.
8882. Across the drainage channel? Yes.
8883. What would be the height of the dam? I do not think it would require to be more than 15 feet high. Dam.
8884. And about what length? About 80 or 100 feet probably.
8885. And the water in that lake when dammed up as you suggest would command all the surrounding country? Yes; the country surrounding the lake and fronting the creek. I fancy it is a shallow lake. In estimating 15 feet as the height of the dam, I am allowing 5 or 6 feet above the surface of the ground.
8886. What is the character of the banks on which the ends of the dam would abut? Black soil. Banks.
8887. Is it good holding ground? Yes, I believe it is.
8888. What other lakes are there which are filled by the river in flood-time? There is the Wangalara, Poopelloe, Gunyulka, Pollioillaluke, in the county of Werunda; Terryawenya, Ratcatcher's, Reed's or Ballabouka, Sawyer's, Brummey's, Victoria, Waterloo, and Eucalyptus, in the county of Livingstone; Malta, Bijiji, Tandure, and Baleka, in the county of Tandora; Menindie, Emu, Cawndilla, Tandou, Nettlegoe, and Speculation, in the county of Menindie; and Woytchugga, on the southern boundary of the county of Menindie. Lakes filled from Darling.
8889. *Chairman.*] I suppose you have never tried to aggregate the areas of all those lakes? No, I have not even had time to see them yet.
8890. *Mr. Gipps.*] Are they all of the same nature as Lake Woytchugga? I believe they are all similar.
8891. There are no particularly large lakes? None very deep, but they are all of considerable area.
8892. There are none of any great elevation? No.
8893. Do they all dry off quickly? Most of them do. The drainage of the flood-waters from the lakes will keep the river navigable below Menindie for eight or ten days after the river has fallen at Wilcannia, and after a larger rise, from two to three weeks.
8894. Do you know anything of the Baroorangee Creek? I do not know it.
8895. There are three or four dams there—I thought perhaps you might know something about them? No, they must be station dams.
8896. Is the Darling below Wilcannia invariably lower than the plains on either side? The bed of the river is always lower. Darling River bed.
8897. And are the banks always higher than the plains, or are they about level with them? As a general rule I think the banks are a little higher than the plains, but the difference in level is not much. Banks.
8898. What is the character of the rains; are they tropical, coming in heavy storms as a general rule? The heaviest rain, as a rule, falls in thunder-storms. There are also light rains of from 5 to 40 points. Rains.
8899. But do you ever get regular tropical rains? No, I do not think so.
8900. Do you know of any irrigation works at all in that part of the country? I do not know of any works of that kind worth mentioning, except the dam previously referred to across the Tallywalka Creek. Irrigation.
8901. Do they irrigate from that? No; it is for the purpose of diverting water into Teryaweynya Lake for storage.
8902. But there is no irrigation? No; simply storage.
8903. Have you ever seen the bed of the river quite dry? No; the lowest I have seen it was in April, '84, when the depth was about 7 or 8 inches where the bed was of a uniform and sandy nature. Supply in Darling.
8904. With what breadth? About 20 or 30 feet.
8905. Was the water fresh then? Quite fresh. I have heard of the water becoming brackish, but have doubts if such was the case. Quality of water.
8906. And flowing? Yes.
8907. Have you seen any large springs in the bed of the river or on the banks? None.
8908. What is the character of the country relative to its adaptability for surface canals—is it retentive soil? The red soil is retentive; the loss due to absorption would probably be greater in the black soil, but I think it might also be considered retentive. There is a good deal of sandy country in the district, which of course would be unsuitable for canals. Retentiveness of soil.

8909.

Mr. W. J. Hanna. 9 July, 1885.

8909. What are the prevalent winds in summer-time? I could not say; there are no constant winds.
8910. Are they continuous? No; occasional gusts from the south and south-west.
8911. Do you think that windmills could be used with advantage? In some places—on the plains for instance.
8912. But not on the borders of the river? No, I do not think they would be reliable on the banks.

Flood in the Dry Lake.

8913. *Mr. M'Mordie.*] Can you give us any particulars of the flood in January last? In the Dry Lake, about 20 miles from Wilcannia there was a hotel the roof of which can only be seen now. There were two teams loaded with wool in the lake, and as the rain was falling so heavily and water beginning to rise, the teamsters yoked up their bullocks to remove the waggons to a place which they considered was above flood-line, but next day the teams and loading were completely covered, although on each team there were three tiers of wool.

Rains.

8914. What quantity of rain fell, and in what length of time? The rain fell from the 21st to the 24th of January. At Wilcannia there were between 9 and 10 inches, but in some parts of the district the fall was 12 inches.
8915. And at what period was the hotel covered? About the 24th.
8916. *Mr. Gipps.*] What was the area of the watershed above? I could not say.

Area.

8917. *Chairman.*] What is the area of the Dry Lake? From 500 to 600 acres.
8918. And the hotel was built on an elevation in the centre of the lake I suppose? Yes; it was supposed to be above the flood-line.

Depth.

8919. Have any depths been taken? Yes; the depth soon after the flood was 36 or 38 feet in the deepest part.
8920. Is the water retained in the lake now? Yes, there is no outlet, and none of the flood-water is lost.
8921. Was the lake filled from the river? No, by the local rainfall.

Catchment area.

8922. Then the catchment area must be very extensive indeed? Yes, but it must be remembered that the fall of rain was unprecedented, and the greatest amount seems to have fallen in this direction. Southward the rain became lighter; at Menindie about 3 inches were registered, and 20 miles further south, from 30 to 50 points.
8923. *Mr. Gipps.*] Could we ascertain the area of the watershed in any way? I dare say it could be obtained approximately by inquiry, and by riding over the locality.
8924. It could not be obtained from any map? I do not think so.

Situation.

8925. *Chairman.*] How is it situated with respect to the Paroo? It is west of the Paroo a long way.
8926. In which county is it? The county of Young.
8927. What special benefit is this great mass of water to the people of the district? It is of use to the station and to the travelling public. The water is several feet above the banks of the tank which was excavated there.

Supply.

8928. How long do you think you may consider the water permanent? About four years.
8929. There is no drainage from it—no creeks running out of it? None.
8930. *Mr. Murray.*] Was it ever known to be full before? Nothing like so much as it is now.
8931. How do you account for the present excessive quantity? By the enormous amount of rain which fell in such a short time.
8932. *Chairman.*] Could you ascertain locally how long after the rain had ceased the water drained by its channels into this place? I think I could.

Further information.

8933. Could you also ascertain if that water came from the waste waters of the Paroo, and append the information to your evidence? I think so; a great deal of valuable information could be obtained in the district just now.
8934. We should be glad to receive any information you could obtain with reference to that particular flood? I shall be very glad to furnish any further information I may be able to gather, and much regret that my duties will not permit me to devote more time for that purpose.

THURSDAY, 16 *JULY*, 1885.

Present:—

Mr. DONKIN, J.P.,	Mr. MURRAY, M.P.,
Mr. GIPPS, C.E.,	Mr. M'MORDIE, M.I.C.E.,
Mr. LYNE, M.P.,	Mr. TARGETT, M.P.

W. J. LYNE, Esq., M.P., President, in the Chair.

Mr. F. P. Solling called in and examined:—

Mr. F. P. Solling. 16 July, 1885.

8935. *President.*] You are a licensed surveyor? Yes.
8936. In what district? The Gwydir. I have been there for six years.
8937. The tracing I have in my hand is by you? Yes. (*Appendix* EE.)

Supply of the Meei.

8938. And a report relative to the supply of the Great Ana-branch of the Gwydir and the Meei? Yes.
8939. What is the principal object you have in view? We desire to re-open the original river, the course of which has been altered during the past thirty years.

Principal river.

8940. Which is the principal river—the right or the left-hand branch? The left-hand branch.
8941. Does the largest quantity of water go down that river now? None at all, unless there is a rise of about 7 feet. It has been silted up on account of a large log coming across the mouth of the river. It is narrow at the junction, and it is completely silted up. The silt is 5 to 6 feet deep.

Silt.

8942. That is shown on the plan here? Yes. I have a plan showing levellings and sections prepared since I wrote that report. I produce it.
8943. Has the river become perfectly dry now? It is perfectly dry. During the past four years there has been water in it only once, I believe.
8944. Are there no waterholes? There are a few fair holes, but the water comes down so seldom that they are of no importance.

Bed of river.

8945. Of what size is the bed of the river? I suppose it is from a chain to a chain and a half in width.

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8946. Is the Gwydir or Great Ana-branch about the same width? It is from two to two and a half chains wide—in some cases more.
8947. Is there much settlement along the banks of the river? The land is nearly all purchased.
8948. Along the banks of the Meei also? Yes.
8949. Is it purchased on large holdings? Principally on large holdings, by lessees. The plan I produce shows to what extent the Crown Lands would be benefited. Alienated land.
8950. There appears to be nothing but reserves left? Nothing but reserves. There may be a few instances lower down in which, when auction sales were stopped, some unalienated portions remained. I calculate that there are altogether 135,320 acres of reserved land which would be benefited immediately.
8951. Is that on the banks of the river? Yes.
8952. Extending over what distance? I have gone back 3½ miles, and the distance down the river from junction to junction is 54 miles.
8953. Can you put in that plan in your evidence? Certainly. I can also give you the plan showing the district of Moree.
8954. What quantity of water now goes down the ana-branch? On an average, I suppose there would be a fresh five times every year. Supply in ana-branch.
8955. There is always plenty of water? Nearly always.
8956. Is it a sandy bed? No; a kind of yellow clay and shingle—gravelly. Bed.
8957. Is it deep? About 25 feet. The north channel has been formed principally during the last thirty years. They are building a bridge at Booloorоо, and the contractor told me that he had to go down only 4 feet below the ordinary level before he came on to the clay of the surrounding plain. There is no ancient river-bed. Some of the oldest residents say that it has been made by the action of flood-waters within the past thirty years. Depth.
8958. What do you propose to do? I thought that all the water now went down the north channel, and that as there was more than the residents required, it would be only reasonable to take away some of it at the junction and allow it to go down through the town of Moree along the original channel. Diversion.
8959. Does this obstruction prevent the water from going to the town of Moree? Yes, altogether.
8960. What water do they get there? They do the best they can. Last summer they had to sink in the gravel for water—about 4 or 5 feet down.
8961. Do you propose an overshot dam across the Great Ana-branch? That was the first proposal; but since taking the levels I am not riveted to either scheme. I think that if a low overshot dam were made (say) 4 feet it would be ample. About 10 or 12 chains of gravel would have to be cut through and removed—the two river beds would then be at same water level, and a rise of even 1 foot would be fairly divided—each branch would take its share according to width. Overshot dam.
8962. Has the Meei a sandy bed? No; it is similar to the ana-branch—gravelly in places, and scarcely any sand. Bed of Meei.
8963. You consider that if a dam of 4 feet were put across the Great Ana-branch it would throw a portion of the water down through the town of Moree to the junction? Yes, if a little gravel were taken away.
8964. Is the country level? It is all plain country.
8965. How is it that the people themselves have not done this if such a little work would supply the town? It is one of those cases in which any one's business is no one's business. Something of the kind was attempted, but the other side commenced to talk law and frightened them out of it.
8966. Is that the principal reason? I suppose so. Now the parties on the Gwydir side seem determined to do something, and as usual there is a little opposition. The stations which would benefit by the scheme are nine or ten in number. With the exception of a few large selections consisting of three or four 640-acre blocks and pre-leases, the land is nearly all in the hands of the lessees. Opposition the scheme.
8967. Is the soil of such a nature that a dam across the river at the point you suggest would stand? I think so; just below the junction there is an immense shingle-bank. The shingle is very large compared with the rest of the shingle; there are large water-worn stones, some of them weighing 10 or 12 pounds. Just after that there is a pretty rapid fall—the water runs strongly. Nature of bank
8968. And you think the dam should be there? Just below the junction.
8969. How far would a 4-foot dam throw the water up the river? A couple of miles fully. Back-water.
8970. Have the people along the Great Ana-branch used the water for other than stock purposes? I think not, excepting the case of the Booloorоо pumping works. With that exception the water is taken out by stock. Booloorоо pumping-works.
8971. There is no irrigation? Only in one instance, of which I have a few particulars. I took the levels, and to a certain extent supervised the watering. Macdonell and Company had 11 acres under cultivation. Last year was the first year; it took eight hours forty minutes' pumping, at a cost of £3 5s. The pumping per minute was 6,500 gallons. Irrigation.
8972. *Mr. Donkin.*] With what sort of pump? Centrifugal. Pump.
8973. *President.*] What did the eight hours' pumping do? In all 3,380,000 gallons were pumped, or on each acre 307,373 gallons. Effect
8974. Were the whole of the 11 acres irrigated in that time? Yes.
8975. To what depth? Such an immense quantity of water was delivered into the drain that we did not know what to do with it. When once the pump starts you cannot stop it. We estimated that about 13½ inches of water were put on to the surface. Depth.
8976. What became of the water? Most of it soaked in; the land was very dry—we had had no rain for five or six months.
8977. What sort of land was it? Red chocolate loam. Soil.
8978. Was the soil disturbed before the water was pumped on to it? It was ploughed; the crop was in at the time.
8979. What crop? Wheat. Crop.
8980. What was the result of the irrigation? No good result. The river came down rather late; the crop was too far advanced. Result
8981. *Mr. Donkin.*] What height was the crop? The crop had been eaten down twice, to prevent it from seeding.
8982. What did they do with it afterwards? They cut a little of it and made some hay, but it was a failure so far as the crop was concerned; the river did not come down soon enough.
8983. At what time of the year was this? It must have been early in November.

Mr. F. P. Sölling. 16 July, 1885.

8984. Have they tried irrigation for grass? No.

8985. *Mr. M'Mordie.*] How did you arrive at the quantity of water pumped in the eight hours forty minutes; was it gauged in the stream or estimated by discharge of the pump? I gauged the stream.

8986. *Mr. Donkin.*] What was the diameter of the pump? I believe it was nearly 2 feet.*

Effect on river.

8987. *President.*] Did the pumping affect the river? It must have affected it considerably.

8988. Did you observe any difference? No, not at this time, because there was a fair stream running down.

Distribution.

8989. *Mr. Donkin.*] How was the water distributed over the ground? There is a gradual slope from the bank of the river; the main channel was blocked at different points.

Main drain.

8990. What was the size of the main drain? About 6 feet wide. Part of it was raised, and other parts were let in according to the levels. On a great portion of the land there were 3 or 4 inches of running water. The ground was thoroughly saturated. I should think that half the amount of water would at any other time thoroughly irrigate the whole of the 11 acres.

8991. *Mr. M'Mordie.*] Is that all the irrigation which has been attempted with that pump? That is all. Macdonell & Company are adding 7 or 8 acres this year, and intend to irrigate it. They will have 18 acres under crop. The cost of pumping is about £9 for twenty-four hours, or £63 per week.

Cost.

8992. *President.*] That would be about 6s. per acre? Yes. Booloorоо Station paid the Company for eight hours forty minutes; they were pumping into the Midkin Creek, and they turned the water off that drain into the cultivation paddock. I may mention that the cost of the machinery was £3,500, and that the water was lifted 25 feet. The machinery is, I believe, the duplicate of the largest pumping machinery in the Colonies.

Machinery.

8993. Perhaps too much water was put on? Of course there was.

8994. Do you think your proposal is better than the proposal to dam the river lower down at Macdonell & Co.'s, about a mile down where there is a neck about 15 chains across? That is a matter which could be determined only by actual survey. I have thought of it since, but I have not examined the locality sufficiently.

Fall of country.

8995. Have you noticed whether the country falls away from the river? In every instance about there it does so. In a heavy flood the water runs in all directions from one watercourse to another.

Supply in ana-branch.

8996. Is there a constant stream running down the Great Ana-branch throughout the year, or does it fluctuate? On an average there is a running stream for seven months in the year.

Source.

8997. Have you been up near the head of the river? No; it is near Armidale.

Snow-water.

8998. You do not know whether there are facilities there for the storing of large quantities of water? No.

8999. Does the water come out of the snows? Several times I have known pure snow-water to come down as far as Moree. The only place, so far as my district is concerned, where dams could be put across to store water is about the junction of the Meei. Up to about 10 miles to the eastward there is almost a continuous sheet of water from 5 to 15 feet deep. If several dams were put across there an immense body of water could be stored. Some of the waterholes there are the largest in the district, and I believe are among the largest in the river.

Storage.

Height above sea.

9000. In your report you say there are wells in the Moree district 875 feet above the sea-level, but in the Railway Report Moree is said to be only 680 feet above the sea-level? I took the height by the aneroid.

9001. In no other way? No.

Selection.

9002. Is there much selection on the Great Ana-branch? It is the same as on the Meei; there are large selectors, but the land has been chiefly purchased by the lessees.

Petition.

9003. I suppose that all who have signed the petition which has been presented to the Commission are resident there? I do not know where they get fifty selectors. Several of the residents whose names are attached to the petition are not near the frontage.

9004. Would they be benefited at all? I suppose they would be indirectly. As far as I can see, it would make no difference if the water were turned, because in ordinary rises of 3 or 4 feet in the Great Ana-branch the water goes right through and runs to waste in the Barwon.

9005. You do not think that these people would be injured? Not in any way.

9006. And you think that others would be benefited if a portion of the water were taken down the Meei? I have no doubt of it.

9007. And the town of Moree would have a water supply? Yes.

Wells.

9008. Have you any knowledge of the wells in the district? I have an extensive knowledge of the wells. I sent in a lengthy report some time ago, giving full particulars.

Silt.

9009. *Mr. Gipps.*] Is there much silt in the Gwydir River in flood-time? A great quantity; it remains in what is called the watercourse, about 23 miles west of Moree.

9010. What is the character of it? It is a kind of clay.

9011. There is no sand in it? Little or no sand. It is very thick—more so in some freshes than in others.

9012. You recommend a low dam of 4 feet? Yes.

Diversion.

9013. At the same time you said that a log across the river had diverted it from its original course? Yes.

9014. Do not you think that a weir across would have the same effect, and would divert the river into some other course? I do not think so.

9015. Why not? Because the water would be able to run over the top of it.

9016. Would not the bed of the river silt up to the top of the weir? It is just possible that it would.

Depth of river-bed.

9017. What is the depth of the river bed below the surface? I suppose from 25 to 30 feet.

Surface-soil.

9018. What is the character of the surface soil? It is black soil to about 2 feet, and then it becomes a kind of friable yellow clay.

Fall.

9019. The top soil is good holding ground for water? No, it is rather the reverse.

9020. Is there any regular inclination of the country between the old and new beds of the river, or *vice versa*? I think, according to measurement, they are nearly the same; the Meei River has the greatest fall.

9021. That is the old river bed? Yes.

9022. What is the average quantity of water going down the river in an ordinary season? I have never made an estimate.

Freshes.

9023. What would be about the depth? The ordinary freshes are from 3 to 5 feet deep, and the water runs at the rate of from 3 to 4 miles an hour.

9024.

* NOTE (*on revision*):—I have since ascertained the diameter to be 20 inches.—F.P.S.

9024. What is the width? In the ana-branch from 2½ to 3 chains. It takes, as a rule, about five days to run down to about knee-deep at the crossings; then it continues to run, unless there is extraordinary dry weather, for months. Mr. F. P. Sölling. 16 July, 1885.

9025. At that depth? Yes; from 6 inches to knee-deep.

9026. What is the width? About 7 or 8 yards at some of the crossings.

9027. Is there a good current when it is low? It is a strong current. Current.

9028. You do not know the actual fall of the river-bed? No; the only idea I have is from the plan showing the levellings which I took from the junction.

9029. What is the character of the shingle? Very coarse gravel. Shingle.

9030. Is it mixed with clay? No, it is pure shingle.

9031. Do you know of any tanks in the district? I have sent in a complete list giving details of the tanks and wells. Tanks.

9032. Do they hold water well? As a rule they do.

9033. What is the nature of the soil? Generally black soil. The best tanks are away from the river. Soil.

9034. Are the winds pretty regular in the district? In the last year there has been scarcely any wind. When you had your first fall of rain down here it was boisterous for about a week; with that exception we have had scarcely any wind this year. Wind.

9035. You could not fly windmills then? There are some up there; some are a success, others are not. Windmills.

THURSDAY, 30 *JULY*, 1885.

At Hay.

Present:—

MR. DONKIN, J.P., | MR. LYNE, M.P.,
MR. GIPPS, C.E., | MR. TARGETT, M.P.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. George Philben called in and examined:—

9036. *President.*] You reside in Hay? I reside in Hay at the present time. Mr. G. Philben. 30 July, 1885.

9037. What is your employment here? I am doing nothing at present. I was Road Superintendent in this Colony for twenty-one years, ten of which I was in charge of Riverina district, making Deniliquin my head-quarters.

9038. Were you here a considerable time? Yes.

9039. How long? From 1870 to 1880—ten years.

9040. Over what extent of country did your duty take you? From Urana to Wilcannia, and from Wentworth along the Murray to Tocumwall.

9041. What is the nature of the country? Level, flat country.

9042. The ordinary Riverina plains I suppose? Yes. Riverina country.

9043. The land as a rule I suppose is rich? Yes, very rich.

9044. During the time that you were Road Superintendent did you experience any extraordinary dry seasons? Not so dry as at present; there were floods in my time from '70 to '75; since then the rainfall was less and the floods not so high. Seasons.

9045. Along the streams you are acquainted with I suppose the flood-waters are not conserved in any way, but simply allowed to run to waste? Except where Nature conserves them; there are several natural reservoirs or lakes on the Murray, the Murrumbidgee and the Darling. Flood-waters. Natural reservoirs.

9046. And on each of these rivers, the Murray, the Murrumbidgee, and the Darling, the flood-waters flow into these natural lakes? Yes, while the rivers are rising.

9047. Are there many of these basins? Yes, a great many on each side, at various distances, from 3 to 20 miles back.

9048. On what part of the river are they mostly situated? If you commence with the Darling, you have the Menindie Lake, and the Poomamaro Lake, Tarraweena Lake, and others. Lakes on the Darling.

9049. How far are they from the river? 2 to 3 miles I should say, the nearest; 15 to 20 the furthest. Distance from river.

9050. What height of flood does it take to fill these lakes? I suppose that when the water rises 14 or 15 feet it flows in in a strong stream. Filling from floods.

9051. Above what level? Summer level.

9052. That is 14 or 15 feet above summer level? Yes.

9053. There is a channel I suppose? Yes, a wide channel to each lake, probably 200 feet wide. Channel.

9054. What depth of water is let into the lakes when the river is in flood? I could not say.

9055. You can give an idea perhaps? I have never taken the depths; they are pretty considerable—20 or 30 feet in some places—they vary.

9056. How long after the flood will the water last? It lasts till the river falls to allow it to flow out again. Out-flow

9057. It flows out then? Yes, while the rivers are falling; some lakes run dry, others do not.

9058. Are no means adopted to stop it? There is nothing to stop it that I am aware of.

9059. The channel then is nearly as deep as the lake itself? Yes, in some instances.

9060. Could anything be done to impound the water? I think so—weirs and embankments. Weirs.

9061. Are there not suitable places at which dams could be thrown across the Darling? I am afraid not; I think you could not well throw a weir across the Darling. Dams on the Darling.

9062. Why? Owing to the nature of the soil; if you were to throw a weir across the Darling the probability is that the water would leave the channel and cut another for itself. I cannot see that it is possible to make weirs in the Lower Darling, Murray, or Murrumbidgee. Nature of soil

9063. Suppose you built a weir up to the top of the bank—a movable weir? The water would tear away the banks and make a new course for itself.

9064. Are there any rocky bars? Not as far as I know; you might throw a dam across the creek going into the lakes, but not in the main channel—I think that would be impracticable. Rocky bars.

9065. If there were rocky bars for foundations could you not do it? Yes, but you have no such bars that I am aware of.

9066.

Mr. G. Philben. 30 July, 1885.

9066. You know that there are plenty in the Darling? Not lower down I think; if you had rocky banks you might do it.

9067. If it were practicable to put weirs across the Darling, you could raise the water and keep a constant supply in the lakes? That is not the way I would do it. When the water is at its highest, if you had a weir across the channel to the lake from the river you might keep the water in it.

9068. But if you raised the water in the river 15 feet, you would obtain a supply of water to let into reservoirs? Yes, you could do so.

Depth of lakes.

9069. These lakes I suppose are about the same depth? I suppose so; I have not taken the depths; they must vary I should think, but that can easily be ascertained by soundings.

Irrigation.

9070. You know of no system of irrigation, even on a small scale, having been carried out on that part of the Darling? Nothing except for gardening. About Wentworth and at squatters' homesteads they pump up water for garden use.

Result.

9071. With what result? They grow splendid fruit—oranges and various other things.

Fruit-growing.

9072. I suppose they have not attempted to grow fruit without using water? No, they raise water for the purpose.

9073. Is it possible to grow fruit without using water? I do not think it is.

9074. The result is that where you have irrigation you get fruit, and where you have no irrigation you get nothing? Yes, that is so.

Flood at Wentworth.

9075. What other parts of these streams do you know? I went down to Wentworth after the flood of 1870 to construct embankments. The flood-waters rise very slowly there, about an inch a day, and they fall about the same rate. The flood of 1870 left the course of the river and crossed the country between the Murray and the Darling; it swept across the flats from the Murray at Wentworth into the Darling and cut immense channels across the streets and knocked down a number of houses.

Underground waters.

9076. How far were those channels from the main bed of the Murray? 3 or 4 miles away in some places; about 12 feet from the surface you find water underground in the town of Wentworth.

9077. Fresh water? Yes; the whole place seems to be afloat in high floods.

9078. Do you find it in all cases? Only in high floods.

9079. The inference from that then would be that the water percolates through? Yes.

9080. Does it come from the river? Yes.

9081. Does it rise and lower with the river for a considerable distance from the river? Yes; Wentworth is on a mud flat, and about 12 feet from the surface you find sand and water in flood-times.

9082. How far does that kind of country extend from the river? 4 or 5 miles, I should say.

9083. Then at all times, I suppose, according to the height of the river, there is an immense natural reservoir containing water? Yes; it forced up the flooring of houses in Wentworth; they had small dams around the houses and went in boats from one house to another; the water forced up the flooring inside, and if you put a stick down in the ground the water would come up. I think the next high flood will do great damage there.

9084. Do you know any other places along the course of the rivers where that occurs? I do. At Euston the flats used to contain water; they had embankments around the hotels and houses as at Wentworth.

Highest floods.

9085. The 1870 flood was the highest known there? It was the highest in the Murray; the flood of 1864 was the highest in the Darling; in 1870 the flood in the Murray was 29 feet 6 inches over summer level, and in 1864 the Darling flood was 32 feet above summer level; it is seldom that the two rivers are in flood at the same time.

9086. One is going down while the other is rising? Yes; one may be in high flood and the other low.

Width of flood at Euston.

9087. Does the water extend far out from the river at Euston in flood-time? Yes, on each side, about 3 or 4 miles.

9088. Did you find the same thing occur at Euston as at Wentworth, that is, the water percolating through the sand? No, but it would do so I am sure.

9089. Do you know anything of the country about Albury? No; but I have been to Corowa, and to the head of the Murrumbidgee, and all over the Manaro country.

Murray water reaching the Edward.

9090. Do you know anything of the fresh that evidently runs out from the Murray into the Billabong? I know that in high floods the water from the Murray finds its way into the Edward about Tocumwal, at Tuppal, and at Gulpa Creek, and some other places.

Lakes on the Murray.

9091. Can you give us any facts about the flood of 1870? The whole country was flooded on each side for a distance of 3 or 4 miles on an average. There is a large lake called the Moira and also another above Moama, both of which are filled from the Murray.

9092. Are they only filled by floods? That is all, I think.

9093. As a general rule I suppose these lakes or depressions could be much oftener filled if means were taken to raise the water in the river and cut channels? Yes; my idea would be to cut channels into them so as to allow the water to flow in freely and to take means to prevent it flowing out when you have it in. There are a number of lakes about Swan Hill on the Victorian side; in some cases dams have been put across these to prevent the water going into them.

9094. What for? For the sake of the grass which grows in the depressions.

Lakes on the Murrumbidgee.

9095. Is that done on the New South Wales side? I am not aware that it is. There is the Yanga Lake on the Murrumbidgee; there are a series of lakes near it; the water flows first into the Yanga Lake and then into the dry lakes; I have observed embankments across from Yanga Lake to the dry lakes on the road from Balranald to Moulamein.

9096. The water from the Murrumbidgee above Balranald passes through these lakes towards the Edward, 20 miles from the Murrumbidgee? Yes. Again, at the Paika Lake the water flows in from the Murrumbidgee; that lake is about 3 miles across; when it is full it works its way down to Euston, and does not come back to the Murrumbidgee again.

9097. So that below the junction of the Lachlan and the Murrumbidgee the country is very flat, and a series of depressions are formed into lakes at flood-times? Yes.

9098. These are in some cases 20 or 30 miles from the river? Yes.

Murrumbidgee and Darling waters joining.

9099. Have you known the waters of the Murrumbidgee and the Darling to join midway or to meet each other in the floods of '64 and '70? They came near to each other.

9100. What is the cause of their not meeting? High land—a sand ridge.

Mr. G. Philben. 30 July, 1885.

9101. Would it be possible to cut through that sand ridge to allow the waters to meet? Yes. I consider it would be advisable to connect all these rivers by cuttings, and plant trees on each side of such cuttings for 20 chains or so.

9102. What is the distance between the two points which the waters from the respective rivers reach? I could not say without taking measurements.

Well at Mount Monara.

9103. Do you know anything of wells in the district which you are in? No, except the well at Mount Monara on the road across to Wilcannia.

Depth.

9104. What depth is that? 100 to 200 feet in sandstone I think.

9105. Is the water found in sandstone? Yes.

Quality.

9106. Is it good water? Yes; but in reference to wells and tanks you would get better information from the Department of Roads, Sydney, where they have all particulars as to depth, &c.

Soakage.

9107. Have you ever noticed that in these rivers the water gets away at various points—soaks into the ground, and leaves the river by underground channels or by percolation? I believe that in some places it does.

Discharge of rivers.

9108. Has it come under your notice that the volume of the river is decreased in some points? Yes. As a rule all the rivers have a large volume up above near the high lands, while down below in the flat country they are narrow. Take the Lachlan for instance; you can scarcely notice where it goes into the Murrumbidgee—where the Murrumbidgee enters the Murray it is a very narrow channel. I believe that the waters of the Murrumbidgee find their way by other channels into the Murray. When the country about Wentworth to the junction of the Murrumbidgee is flooded there is a network of creeks and billabongs which are filled from the river.

Rise and fall of rivers.

9109. This country is so level that if water is kept at a slight elevation over the surface the whole country would be under command for irrigation, would it not? Yes, certainly. The water coming down to Wentworth from the heads of the rivers comes very slowly; the snow-waters generally come after the flood-waters have passed; after the floods the lakes commence to empty themselves out again, thereby causing the water to rise very slowly in the rivers lower down.

9110. The water leaving the lakes again after they have been filled causes the river to rise slowly? Yes, it never rises rapidly below here; it has to fill the lakes before it comes down; then the lakes begin to pay the water out slowly; it may rise about 1 inch in a day for three months at Wentworth, and fall again at the same rate.

Talyawalka Creek.

9111. Do you know anything about Talyawalka Creek? Yes; I made sections over it at Menindie and Wilcannia, for bridges on the road Wentworth to Wilcannia, and Wilcannia to Booligal. It leaves the Darling above Wilcannia, and flows back into the Darling below Menindie.

Ana-branch.

9112. Do you think that the water flows underneath the surface between those two points? I think it must. There is an ana-branch from the Darling below Menindie into the Murray. Where it leaves the Darling the squatters made a cutting 14½ feet above summer level, so as to allow the water from the Darling to run into this ana-branch.

Cutting.

9113. The bed of the cutting? Yes; the bed of the cutting from the Darling, to allow the water into the ana-branch, was the height stated over summer level—15 feet.

9114. How is it that at that point the outlet was so much higher than 15 feet? It is only a short distance below Menindie where this cutting was made.

9115. You said that the outlet into the lake at Menindie is 15 feet above summer level at the present time, and that the squatters lowered this outlet to 14 feet? That refers to the cutting into the ana-branch below Menindie.

9116. Then that must have been much higher than one of the lakes? It gets filled up with sand, and has no connection or reference to the lakes at Menindie; the level is of course lower as it is lower down the river.

Artesian water.

9117. Do you know of any instance in this part of the country where there is artesian water? No. I think it desirable to sink for artesian water between here and Deniliquin, and here and Booligal.

9118. Have you any theory that there is artesian water there? I have not; we do not know what is underneath.

9119. If the geologists say that there is no artesian water, do you think that it would be worth while going to the expense of sinking? I think that it is very difficult for geologists or any one else to form an opinion on that point; it has not been ascertained by borings, and there is no outcrop or strata to indicate what is under the surface.

9120. Our Government Geologist says that there can be no water in the whole of that country except from the local rains? How can he say so, in the absence of borings or outcrop of some strata?—the cost would not be so great after all to put down a few borings.

9121. Well, he says so: do you think that in the face of that it would be wise to go to the expense of sinking for artesian water? The squatters are sinking at great expense; if you were to sink two deep shafts they would afford some test of the ground and let the squatters know what they might expect.

Value of irrigated land.

9122. How would you estimate the difference between the value of land which could be well irrigated and land which is in its natural state? I have had no experience of irrigated land: the difference would be very great, I have no doubt.

Depth of bores.

9123. *Mr. Donkin.*] What is the depth of any sinking here? 200 or 300 feet.

9124. You do not know of any deep shafts—2,000 feet? No; I was told that a shaft was sunk by Mr. Taylor, of Euston Station, to about 400 feet, and that it went through shale.

Trial shafts.

9125. You think that it would be advisable for the Government to put down one or two deep trial shafts? I do, certainly.

9126. At present the mode of procedure is only haphazard; they have no idea where they ought to sink for water? No, they have nothing to go by.

Willandra Creek.

9127. You know Willandra Creek? Yes, I have crossed it several times.

9128. Do you think that there would be any great advantage in having a weir put across the Lachlan near the mouth of that creek? Yes; it would be an advantage to dam the rivers where they are not navigable, but it would be impracticable to dam them where they are navigable.

Out-run of Lachlan.

9129. You say that the Lachlan runs out into a flat or swamp which is hardly noticeable? Yes, near Oxley, where there are extensive reed-beds and swampy ground.

Mr. G. Philben. 30 July, 1885.

9130. Is there underground soakage there? Yes, I think so; water find its way underground into the Murrumbidgee, and also the Murray.

Dams on the Lachlan.

9131. You do not know of any dam which has stood in the Lachlan? No; I have no knowledge of the Lachlan above Booligal, but I believe it is quite practicable to construct dams on it, and that they would be of great advantage in conserving water.

9132. Do you think it could be done? Wherever you have suitable ground of course it could.

Objections to dams on the Darling.

9133. You say that you do not think it possible to put a weir across the Darling? Not in the Lower Darling.

9134. If you could do it in the Upper Darling, why not in the Lower Darling? Because in the one case the ground is suitable and in the other it is not; the country in the Upper Darling is of a different formation from that in the Lower Darling, being rock and hard granite, with suitable foundation for weirs.

Movable weirs.

9135. *Mr. Gipps.*] What is your objection to the construction of movable weirs across the Darling? I think it would be impracticable to construct them in the Lower Darling.

9136. On what account? The nature of the country: if you put an obstruction in the way of the channel the water goes underneath or cuts a fresh course.

9137. Are you aware that with movable weirs you can let the water down flush with the bed of the river in times of flood? Yes, but it is very difficult to interfere with the waters of the Darling, from Wilcannia downwards.

9138. If the dam had movable wings what objection would there be to it then? No objection, but I think that the expense would be so great that the work would be almost impracticable.

9139. Are you aware that they are constructed in France and other countries at £20 a foot? We have not the same kind of country in this part of Riverina; I think the formation is different.

Bed of Darling.

9140. What is the bed of the Lower Darling—are there any quicksands? Yes, 12 feet below the surface at Wentworth there are quicksands.

Windmills.

9141. Do you consider that windmills are a fairly reliable power to raise water at all seasons? I do not think they are—they do not seem to work well.

Winds.

9142. Are the winds sufficiently continuous? No, I think not.

9143. Do you think that they could be worked to advantage as air accumulators? I do not know; they had a very good windmill of the latest construction at Perricoota, and they had to take it away as being unsuitable.

9144. Do you know the diameter of the wheel? No; it was one of the most modern, but they had to do away with it and substitute steam power.

Irrigation.

9145. *Mr. Targett.*] Do you know of any irrigated country around a dam? No.

9146. Some of the gardens in the town are irrigated? Yes, the Chinese gardens.

9147. Do they flood the land with water? They water their gardens from the river and wells here and at other places in Riverina.

Results.

9148. Are good results obtained? Yes, very good indeed.

9149. Through any seasons? Yes.

9150. The soil is very productive when irrigated? Yes, very productive.

9151. Would it be possible for irrigation to be carried on at a profit if the water were raised by steam power? I have had no experience to warrant me in offering an opinion, but I think it would. I have seen irrigation at Nevada; they bring the water down from the mountains by cut channels and flumes, and let it run in; it was very poor-looking country, full of boulders and sand and sage-bush, but by allowing the water to run over it they have succeeded in growing all kinds of produce in the greatest abundance.

9152. Do you know in what places they obtain water in this district by sinking? We have tanks and wells all the way from here to Booligal and Wilcannia; besides they have tanks and wells on all the stations.

9153. Do you know that there is water obtainable in wells not above 12 feet deep? No.

9154. Do you know Mr. Gibson's place? No.

Mr. Allen Lakeman called in and examined:—

Mr. A. Lakeman. 30 July, 1885.

9155. *President.*] You were lately Mayor of Hay? Yes.

9156. You have resided here for some time? About fifteen years.

9157. I think you have a brewery? Yes.

9158. And some land selections? Yes.

9159. Do you carry out any system of irrigation on those land selections? No; we are 20 miles away from the river.

Irrigation.

9160. Have you any place near the river where you carry on irrigation? We have done a little there, but only in a garden.

9161. With what result? We can grow anything with water.

9162. And you pump up from the river? Yes.

9163. Is there plenty? Yes, for every purpose.

9164. If others did what you do, but on a larger scale, do you think the river would stand any amount of pumping? I think it would.

Supply in river.

9165. There is no fear of its going dry? No; if you were to stop it for twenty-four hours you would have the water over the banks.

Seasons.

9166. The seasons have been very dry about here lately? Yes, during the last four years.

Loss of stock.

9167. What have been the losses in stock? I do not know.

9168. You have had cattle of course? Yes. I think that the losses have been very heavy.

9169. What would the percentage be about Hay? I should think that half the stock had been lost.

9170. Do you think it possible, if the water were well conserved, to grow feed to feed the sheep in dry times? I should think so.

Storage of fodder.

9171. And do you think it would be possible to grow and store fodder to prevent the large mortality that takes place at present? Yes.

Want of water and feed.

9172. I suppose that one of the greatest drawbacks selectors have to fight against here is the want of water Not altogether. Last year the selectors who had made provision for water were badly off for want of feed where water was plentiful there was no grass; it was want of grass that killed the sheep.

Mr. A. Lukeman.

30 July, 1885.

9173. If a selector had water at hand to irrigate, could he not keep stock alive and carry on operations during any season? Yes; the drier the season the better the herbage will grow with irrigation.

9174. It is almost like a hotbed? Yes; if you have a January rain you can almost see the grass grow.

Caking of soil.

9175. Do you think that if water is run upon the land without the surface being disturbed it will cake the soil and thus do very little good? I think it will.

9176. But that will not occur if you disturb the surface? It does to a certain extent; some soil will cake under any circumstances; other soil will not. The black, heavy soil will cake, but not the red, loamy soil.

9177. Do you know anything about the Murray? No, I do not.

Distribution from Murrumbidgee.

9178. You can form no comparison between the system of the Murray and that of the Murrumbidgee? No.

9179. I suppose it will be acknowledged that, if a scheme be proposed by the Commission by which the Murrumbidgee can be diverted for the irrigation of the country, it will do a great deal of good? I do not know, unless you had some means of distributing it. Supposing that the supply of water were as large again as it is now, unless it were distributed on the top it would be of no use to us.

Supply for irrigation.

9180. Supposing it possible to throw either movable or fixed weirs across the stream and raise the water to the top of the banks so as to provide a supply when you required it, would not that give a large supply for irrigation as well as for stock purposes when the Snowy River water comes down? I think there is water enough now with conserving it, without the Snowy River.

9181. Do I understand you to say that there is water enough to supply the people residing in the district now? Yes, sufficient for the people who might reside here, if plenty of water were supplied to work their selections. As I have seen the river in the winter-time there is sufficient water, if it can be conserved, to irrigate the land of the whole district between here and the Lachlan. In 1870 the two rivers were really joined at different places between here and Narrandera—it ran over the banks.

The Merool.

9182. There is a watercourse called the Merool, which is a continuation of the river out from Narrandera: is there any theory that the water comes from the Murrumbidgee? It did in 1870.

9183. How far did it go? Right across to the Lachlan; the plain was one sheet of water in 1870.

Conservation at heads.

9184. Then your idea would be that the water should be conserved first, I suppose, towards the head of the river, and then be diverted by means of canals on the higher country through the plains? That is what I think the most feasible scheme.

9185. You have had considerable experience of local government here? Yes.

Legislation.

9186. What legislation would you suggest to provide for dealing with the conservation and distribution of water? That is a matter I have not thought of; I look upon it as more of a national undertaking than a local one.

Local authorities.

9187. I am speaking of the distribution of water: suppose that an Act were passed giving certain parties power to deal with the matter, do you think it should be placed in the hands of local individuals? I am in favour of local government as a rule, but I think that the distribution of water would be something beyond the sphere of local government. I have never formulated any scheme upon the subject in my own mind. I have read about what has been done in America, and it seems to me a very good plan to have some supreme authority over the whole lot. Then you can have local authorities; my idea is that the local people can control their own affairs better than the Government.

9188. What do you think would be the value to a person with a small area of country if he had a constant supply of water? It is hardly possible to form an estimate.

Water-rate.

9189. What would they pay as a rate for the water? If a man were farming, and it could be made a certainty—and a crop would be a certainty in our climate with water—he could afford to pay double what he is paying now.

9190. Do you think 10s. or £1 an acre would be about the amount? If I were a farmer I would pay 10s. an acre.

9191. Do you not think it would be worth £1? I think it would be worth £5 an acre.

Weir.

9192. *Mr. Donkin.*] You were speaking of the Murrumbidgee: if a weir were erected in that river you think there would be a plentiful supply? I do.

Supply.

9193. Has the Murrumbidgee ever run out—has it ever been short of water? Never.

Expense of pumping.

9194. If they have plenty of water in it now, why do they not use it for irrigation? Because it is too expensive to pump it.

9195. If they could afford to pay 10s. or £1 an acre, the water would still have to be taken to the land? Yes.

Farms.

9196. Do you think it has had a fair trial? I do not think it has; but from what we can make out it is too expensive, and therefore impracticable. There are no small farms on the river; the land has all been bought by the capitalists.

Flooding black soil.

9197. Have you had any experience of flooding on the black soil? Yes.

9198. To any large extent? About 60 acres.

9199. Would it not be better to flood the land as it is now without breaking it, in order to grow the natural grasses? I hardly think it would.

9200. Is your experience against that? We do not try that course; we plough it up well.

9201. If you flooded here in summer would the land crack? I do not think it would crack much if flooded once or twice.

9202. You think that the water in the river could be conserved so as to prevent waste? Yes.

Navigation.

9203. But that would prevent navigation? Yes.

Irrigation.

9204. Which would be of most advantage to the country? Irrigation.

9205. *Mr. Gipps.*] What is the best power you use for pumping? Steam power.

Windmills.

9206. Have you tried windmills? They have been tried.

9207. What height have you to pump? We can pump 26 feet.

9208. Does the river percolate into the adjoining country on both sides? No, it does not; we do our pumping right on the river bank.

Wells.

9209. Do you know the average depth they have to go in sinking wells in the country? I sank a well 20 miles from the river, and there are three wells within 10 miles of us. We went 107 feet before we got the water. The water then rose within 60 feet of the surface. Sometimes it is struck at 80 feet.

Rise.

9210. Does the height of the river seem to affect the wells? Not a bit. I have a well over the river here, within, I suppose, 50 yards of the river, and the water does not come from the river—it is different water altogether.

Mr. A. Lakeman. 30 July, 1885.

altogether. The depth of the well is 86 feet. I put a well in the bend, just down the street here, in front of the Council Chambers, about 100 yards from Simpson-street, and the water in that well is quite salt. Mr. Esplin, of Tattersall's Hotel, put down several wells on his premises and got salt water.

Strata. 9211. Are there any shells? No, nothing but clay and sand; that is all that is found anywhere in this district; there is no stone of any sort.

Flood, 1870. 9212. *Mr. Targett.*] You said that in the flood of 1870 the rivers met: at what point was that? They ran out at different points. The Murrumbidgee overflowed just above the Show-ground, and the water ran across there and went into the Lachlan, across the Booligal Road about 5 miles from here. Wherever there was low ground the water was all over.

9213. *Mr. Gipps.*] The country must be very flat? There is not a hill anywhere in the district.

Windmills. 9214. *Mr. Targett.*] Do you know whether windmills have been successfully tried? I do not know.

9215. Do you think they will be of service; are the winds sufficiently strong and continuous? I think not; just when you want the water it is not available.

Steam. 9216. You consider steam too expensive? Yes, on a large scale; fuel is too dear.

Source of wells. 9217. You do not think that the water comes from the river into those wells? I think it does not; the water is of a different character.

9218. Might not that arise from the nature of the local deposits? No, it is not so. There is a large quantity of magnesia in the water.

Quality. 9219. Would you not be inclined to think that the water does come from the river? I should think it would come quicker, and that we should not have to go so deep for it if it came from the river. We sank below the bed of the river—it must have been 50 feet below. Dozens of wells were put down here in the old days, and in all they got salt water.

Salt water.

Percolation. 9220. You do not think much water is wasted here in percolation? I do not think that any is.

Impermeable stratum. 9221. *President.*] Then there must be an impermeable stratum close to the river bed? I think so; it is clay. If you go over the river you will find a Chinese garden, the proprietor of which put down a well. He used to get water from the river, and when the river went down the banks sloped in and he had to put a drive in to get the water.

9222. According to that evidence it is only at certain points that the impermeable stratum exists: many witnesses have stated that at various points along the river's course the water gets away? I should not think it did in this part of the river.

9223. If it does, it must be in certain particular spots? I should say that it does not get away between Narrandera and here.

Rise in wells. 9224. You said you had put down some wells in which the water rose to a certain height? Yes, about 60 feet from the surface.

9225. What is the cause? There must be a big supply underneath.

9226. Where does it come from? I do not know.

9227. That is artesian water? Yes, no doubt it is. It comes up to within 60 feet of the surface. When we broke through into the water it shot up 10 feet high, like a spout, but ultimately settled down. No doubt there is a very large supply of water under the ground here, wherever it comes from.

Underground supply.

9228. *Mr. Gipps.*] Did the drawing of the rods alter the level? Not at all.

Deepest well. 9229. *Mr. Donkin.*] What is the deepest well that you know of? I should think about 120 or 130 feet.

Test boring. 9230. Do you think it would be a good thing for the Government to put down a bore to test the depth of the water? Yes; we were promised that a borer would be sent here some time ago. Mr. Henderson promised to come and put a bore down on a spot chosen by himself, about 9 miles from here, on Hillston Road.

Natural grasses. 9231. *President.*] In irrigating do you think that natural grasses are more suitable than artificial grasses? I think they are better.

Lucerne. 9232. Do not you think lucerne and English grasses would be suitable? I think the natural grasses are better, and if they were better cultivated we should have better feed.

9233. *Mr. Donkin.*] You could not raise the artificial grasses by distributing the water over the surface as it is at present? No, I do not think you could.

Mr. John Keighran called in and examined:—

Mr. J. Keighran. 30 July, 1885.

9234. *President.*] What is your business now? I am Stock Inspector.

9235. Have you been long in this part of the country? Off and on about thirty-five years.

9236. On the Darling? No, principally on the Lachlan and here.

The Willandra. 9237. You are well acquainted with the Willandra Billabong? Yes, I was stationed on the Lachlan eight years.

Diversion. 9238. Do you think it possible to divert a permanent supply of water into that Billabong by damming the Lachlan? Of course if you were to put a dam on the Lachlan you would have a permanent supply, but you would be depriving the people down below, unless you could preserve enough during a big flood. At Hillston there would be no water at all. I have seen water so scarce in 1866 that you could not get a drink of water out of it.

Ponds. 9239. Has it been so since it was stocked with sheep? Yes, you can go miles and find nothing but a chain of ponds.

Movable weir. 9240. No harm would arise from placing a movable weir in the river, which could be lowered in flood-times? I have no experience of movable weirs.

9241. Have you had any experience of irrigation? None.

Value of irrigated land. 9242. Can you give any idea of the difference in value of irrigated and non-irrigated country? If you could irrigate it you could have paddocks in which to grow lucerne.

Food. 9243. Do you think it practicable with irrigation to grow enough food for stock in bad seasons? I do.

9244. You have no idea as to the quantity of artificial food which it takes to keep stock? No; we have always had to depend on the natural grasses.

Report on Willandra. 9245. What was the nature of the report you made to the Government about the Willandra Billabong? They wanted to dam it, and I said that the people below would never sanction it, as it would leave them without water.

Mr. J. Keighran. 30 July, 1885.

9246. When did you make the report? About eighteen months ago.
9247. You did not then consider the possibility of having anything but permanent dams? No.
9248. Do you think it possible to construct a dam that will stand? Yes, a dam to let the water run over it, or a permanent dam to let the water run down the creek.
Dam on Lachlan.
9249. Do you think it possible to dam the Lachlan? You could dam the Lachlan.
9250. Would it break out? It would break out and run all over the country. At One-tree you could start and cross thirty odd creeks before you got to the Lachlan where it used to break out.
Flood, 1870.
9251. Do you know whether the flood of 1870 went across through the Merool Creek and the Lachlan to the Murrumbidgee? Yes, it did.
Merool Creek.
9252. Then it would take very little to divert the waters of the Murrumbidgee into the creek? It would take a good-size dam. It breaks out at the back of Groongal.
9253. You think the water in the Merool Creek comes from where? It breaks through above Benerembah.
9254. And it runs down into the Lachlan? Yes.
9255. The Merool Creek is not a permanent creek? No, you would never notice that it was a creek at all till you saw the water in it; it is only a little dip.
Soakage.
9256. Is the soil sufficiently retentive to keep the water without soakage? There would be a lot of soakage.
9257. If the bed of the creek is dammed it would be possible to keep the water? Yes.
Command of plains.
9258. If you had water, the elevation is such that it would command all the plains by gravitation? Yes.
9259. Is the Willandra sufficiently high to command any great extent of country if water was diverted into it? It would go down upon Mossgiel.
Distribution from Willandra.
9260. If you diverted it into the Willandra, is that sufficiently high to send it to the right or left over the plains? You could send it all. A lot of shallow creeks break off, and it passes back into the Lachlan.
9261. If that Willandra were dammed you could command a great deal of country? You could send the water all over the plains.
Height of Willandra.
9262. *Mr. Donkin.*] What is the height of the Willandra Creek above the bed of the Lachlan? A flood of 14 or 15 feet in the Lachlan will run into the Willandra.
Weir.
9263. Would there be any objection to put up a weir in the Lachlan that would allow the flood-water to pass? No, but they would require the dams already there to preserve water. If they were cut away there would be no water at all.
9264. Are there no dams above Willandra Creek? No.
9265 There would be no objection to put in a dam? No, as long as they allowed the water to flow on.
9266. There would be no objection to an overshot dam 13 or 14 feet high? I do not think there would be any objection.
Length of Willandra.
9267. The Willandra runs down a couple of hundred miles? Yes, it goes a long way.
The Merool.
9268. You were speaking of Merool Creek? You can hardly tell that it is a creek at all. You can dam the Murrumbidgee to fill the Merool Creek.
9269. Where does it join the Murrumbidgee? Somewhere about Mr. Macfarland's station.
9270. Actually the Merool Creek does not find its way to the Murrumbidgee—it runs into the plains? Yes, and through to the Lachlan.
9271. In fact it intersects the whole country between here and the Lachlan? Yes, in little branches.
9272. Do you know of any instances in which they have used water got by pumping for irrigation purposes? No.
Weirs in Lachlan.
9273. *President.*] You said that if the Lachlan were dammed to divert the water into the Willandra the Lachlan would be dry, but suppose it were dammed with a regulating weir at various points so as to keep the bed of the river full of water? That is what it would require.
9274. There would be no objection then? No, as long as the people below were supplied with water.
Course of Willandra.
9275. You also said that if the waters were turned into the Willandra it could be sent through to the Teryaweynya Lake: is there no high or ridgy country between the Lachlan and the Darling, which would prevent that? No, it is a level country till you get to Ivanhoe.*
9276. Were you in that part of the country in the flood of 1870? I was.
9277. Do you know how far the Darling water went out? I do not; I know that the Lachlan water went over a large tract of country; I should say that the Lachlan water went back 70 or 80 miles.
9278. If the water could be turned into the Teryaweynya Lake, how is it that year it did not goin to it? I think it did.
9279. And you think that the waters actually joined? I think so.
Dams in Lachlan.
9280. *Mr. Gipps.*] What is the character of the dams in the Lachlan? Clay. Those are the only dams that would stand.
By-wash.
9281. How do they manage with the floods? Let it go over the plains by a natural by-wash, if possible.
Banks.
9282. What is the character of the banks of the river? Black soil.
Height of flood.
9283. What was the height of the Murrumbidgee in 1870, when the stream ran into the Merool Creek? I could not exactly say. It was running across the street in Hay, and it was up to the saddle-flaps nearly, 8 miles out here.
Cabbage Garden Creek.
9284. Is that the only instance you have known of the water flowing into the Merool Creek? There is another creek, called the Cabbage Garden Creek, 10 miles below Hillston.
9285. Could that be diverted into the Merool? It could.
9286. *Mr. Targett.*] We have always been given to understand that the Darling and the Lachlan have never joined, but you think they have? I am not positive, but I think so.
Reservoirs.
Banks.
9287. With regard to Willandra Creek, do you know of any place above where you could get reservoirs of sufficient size to keep it filled? No, there is no place there; the banks get higher as you go up the river.
Supply from floods.
9288. Could you not do it by damming? Yes, you could do it that way.
9289. Do think the floods sufficient to keep them filled? We used to get a flood that would go down the Willandra and the Merrowie Creek every three years. It would require an overshot dam, and the river would have to be locked. Wherever the water gets over the dam it cuts a way back again, and when the water returns it will cut a channel deeper than the bed of the river.

9290.

* Note (*on revision*):—Since answering this question I am doubtful if the Lachlan in any state of flood joins the Darling water or flows into Teryaweynya Lake. The Willandra appears to be absorbed by lakes and swamps running through Whitmibah, Kilfera N., N. Clare A and B, Kilfera A, B, and D, Manfred W., Mulurulu, Panbar, to large swamp called Juanbung. My experience in 1870 was not further N. than Kilfera and Manfred.—J. K.

Mr. J. Keighran. 30 July, 1885.

9290. Do you think the banks sufficiently impermeable above? The land is better above than below.

9291. *President.*] Is it your experience that near the bank of the river the land is higher than it is when you get a little further away on the plains? It is so, especially about the Willandra, but a little further down the land is more level.

9292. Do you not find that there is a little rise? Yes, but very little.

The Merrowie Creek.

9293. *Mr. Donkin.*] Is the Merrowie Creek any size? Yes, nearly as big as the Willandra.

9294. Then whatever was done to the Willandra Creek might be done to the Merrowie Creek? Yes.

Mr. Robert Gibson called in and examined :—

Mr. R. Gibson. 30 July, 1885.

9295. *President.*] You are a selector? Yes.

9296. In which part of the country have you selected? Half-way between here and Hillston, near the Merool Creek.

9297. You were not there in 1870, I suppose? No.

Merool Creek.

9298. There has been no flood in the creek since? No. I have seen the creek run once; that was from a heavy rainfall, when we had 8 inches in one night.

Want of grass.

9299. Has the country suffered much out there during the past two or three years for want of rain? From want of grass more than from want of water.

Tanks.

9300. Have you tanks? Yes.

Size.

9301. What size did you make them? 2,000-yard tanks are big enough for our paddocks.

9302. What depth are they? 8 or 9 feet.

Supply.

9303. When these are filled how long do you expect them to last? We expect rain to come about April, and they will last until the following April if they are filled in October.

9304. About six months? Yes.

Wells.

9305. Have you wells also? Yes; we get shallow water at a depth of 15 feet up to a supply for 1,000 sheep; that is about as much as a well will do.

Permanent water

9306. Have you deeper wells? There is permanent water from 70 to 90 feet.

Source.

9307. Is it local water, or does it come from some other source? I do not think it is local water.

9308. When you strike it does it rise in the well? Sometimes it does, and sometimes it does not.

Quality.

9309. Is that water good also? It is good stock water this side of our place; from there to Hay, 50 miles, you get water good for stock; on the other side there have been a number of poisonous wells.

9310. Does the water destroy the stock? Sheep will not drink it.

Poison.

9311. What is the poison? I do not know; the sheep will not drink the water.

9312. Can you get these wells anywhere? For 50 miles out. There are two wells at Cowl Cowl, within 30 miles of Hillston, which poisoned 5,000 sheep. At Old Gunbar a Government well was sunk about six months ago; it cost a lot of money, and the water is bad. The residents of the district have petitioned the Government to go further and try to get good water.

Whim and whip.

9313. By what means do you raise the water? By whim and whip.

9314. No windmills have been tried out there? No, not for stock.

Artificial feed.

9315. Do you think it possible to grow sufficient artificial feed and store it for stock, to tide over dry seasons, if you had the water at command, supposing a supply were diverted from Merool Creek? No doubt a certain area could be irrigated sufficient to carry us through a drought.

9316. Do you think a sufficient area could be irrigated to feed sheep through dry times? Yes.

9317. And do you think the selectors would do that if they had the water? We are trying to do it now without the water.

9318. But the results are very precarious? Yes; last year there was no crop at all.

Quality of land.

9319. If you had the water at command, could you not have crops every year? Yes; it is good cultivation land.

9320. I suppose it is level land—that there would be little expense in preparing the land for the water? No expense.

Water-rate.

9321. What do you think the selectors would be prepared to pay per acre for land irrigated? They would be prepared to pay a fair value if they could ensure good crops.

Value of land.

9322. What do you think would be the difference in the value between irrigated and unirrigated land? I think it would double the produce of the land.

Evaporation.

9323. In these tanks that you sink 9 feet deep do you find much evaporation? Yes; it requires very heavy rains to keep up the supply.

9324. Does the water go by stock drinking it, or by evaporation? It goes by drawing it if we work a shallow well.

9325. I am speaking of tanks? I think that as much goes by evaporation as in any other way. The evaporation is considerable.

Percolation.

9326. *Mr. Gipps.*] Is there much loss by percolation? Not after the first year.

Dams.

9327. *Mr. Donkin.*] Have you dams on the Merool Creek? There are dams.

Merool channel.

9328. Is it a well-defined channel? Yes.

9329. If you had dams, could you not conserve the water? On the stations I have seen the water dammed and conserved, but it is shallow; there is no depth, and it spreads over a lot of country.

9330. If you had dams on the Merool Creek, would it pay you to use the water for irrigation? If we had the water it would be worth trying.

9331. You would get the water the first flood that came? I have been there ten years, and have only seen the water dammed back by a station dam one summer.

9332. Could you say from experience what the value of water would be for irrigation? No.

9333. Have the farmers tried it? They have no water to try it with.

Shallow wells. Sweet water.

9334. *Mr. Gipps.*] In what direction do these shallow wells with sweet water extend? There is a strip of country about 16 miles long, and in places you can trace it by the cooba trees. In some places it goes into basins, and then into water channels again not above 10 or 20 yards wide. The tree is a native willow.

Cost of wells.

9335. What is the cost of sinking these wells? About 10s. a foot, all material being provided by the owner.

9336. You have to line them? Yes, with timber.

9337.

Mr. R. Gibson. 30 July, 1885.

9337. What is the character of the soil? Clay and sand. Wherever you find the native willow it is a sure indication of water underneath. If there are a lot of willows there is a good supply; if there are only one or two the supply will not be worth much.

9338. *Mr. Targett.*] Did you lose much stock during the last dry season? Not this drought; we did eight years ago. Loss of stock.

9339. You have had plenty of water since the big flood? Yes. Water supply.

9340. Have you had sufficient feed? We had to cut scrub last summer, or we should have lost stock. Feed.

9341. What area do you allow for sheep for all seasons? The last three or four have been dry years; I should say from 3 to 4 acres per sheep. Acres per sheep.

9342. What size are your paddocks? 1,200 to 1,400 acres. Size of paddocks.

9343. You think it would not be safe to run more than a sheep to 3 or 4 acres? No.

9344. You have never had water come down the Merool Creek except in the case you refer to? Never, except on that night.

9345. How long did the creek flow? There was water enough for a long time; it was flowing for three or four months. The station dam was washed away by that flood. Flow in the Merool.

9346. In the ordinary seasons the land would not carry more one sheep to 4 acres then? Yes; in good seasons a sheep to 2 acres.

9347. *Mr. Donkin.*] Which is the best course to pursue—to eat the grass well down in good seasons, or to carry a moderate number of stock in all seasons? We have tried a moderate amount all through, and experience has shown we have been right. We have had no loss. If we had stocked heavily in the good seasons we should have had to clear all away last year. It was a very dry year; we had not more than 8 inches of rain, and we had not to work the wells. Stocking.

Mr. George Sides called in and examined:—

Mr. G. Sides. 30 July, 1885

9348. *President.*] In what part of the country do you live? I live 17 or 18 miles north-east of the last witness.

9349. What area of land have you? 2,500 acres.

9350. It is a family selection I suppose? Yes, it belongs to the family. Selection.

9351. Do you run stock on it or cultivate it? I have cultivated some, but I run stock on it generally.

9352. Do you find that you can ensure crops without irrigation? I find that I cannot. Crops.

9353. How many years have you been there? Four years.

9354. And you have had dry seasons all the time? Yes. Season.

9355. Have you had any losses in stock? Not many; I did not stock much. Losses.

9356. You have had no losses? No serious losses. I did not see my way to buy stock to lose them as my neighbours were losing them; I therefore sold my grass.

9357. How many acres of your land does it take to carry a sheep? In a moderate season, between 2 and 3 acres will carry a sheep. Acres per sheep.

9358. Have you any wells? Yes. Wells.

9359. What depth? 142 feet. Depth.

9360. Did you get the shallow wells the last witness was speaking of? No.

9361. Is it a good supply of water? No. I went through yellow rock, and got it in 55 feet. Supply.

9362. Do you know what gypsum is? Yes; it was not that; the rock I speak of is brown and very hard. It will not shoot; I put sixteen shots in and they had no effect. Strata.

9363. And you got through that? Yes.

9364. What distance? About 7 feet.

9365. How far below did you go before you struck water? I struck water just below that about 10 or 12 feet.

9366. What was it in? Sand.

9367. Did the water rise? No, that did not rise. I went through that water, which I believe would have poisoned anything, and I got good water in three veins of sand about 142 feet deep. Rise.

9368. What did you go through just above that water? Sand.

9369. Did the water rise? Yes, it came up over 70 feet in the shaft.

9370. Was there a good supply? Yes. Supply.

9371. Have you more than one well? No.

9372. Have you tanks also? Yes. Tanks.

9373. What depth do you make them? 9 feet 6 inches. Depth.

9374. Does that water last six months? It depends on the stock and the weather. If the weather is windy and hot, the water will not last. Supply.

9375. You have no idea of the amount of the evaporation in windy weather? I have a tank over 2 chains in length by 72 feet, and I noticed that in one windy week it went down about 7 inches. Evaporation.

9376. The wind I suppose causes greater evaporation than heat? Oh, there is no comparison.

9377. Do you think that a 9-feet tank will last for ordinary times? That will depend upon the number of stock coming to it; with an average supply it would last in ordinary times. Supply.

9378. I believe you have spoken to the last witness about some poisoned wells? Yes, there are some within 4 miles of where I have my wells. Poisoned wells.

9379. Have you known any sheep to be poisoned? I have been told of it by station hands. When I spoke of putting shafts down they advised me not to do so.

9380. You have not had stock poisoned? No. I have not used the well; just as I was ready for it a storm came and filled the tank.

9381. Have you used water from the well? No, but I could drink it myself.

9382. What did you do with the water that is supposed to be poisonous? It did not make 200 gallons a day; the drift was too small to be of much injury.

9383. You have not puddled it off? No, I slabbed it.

9384. Do you think that if other selectors out there were able to obtain water they would avail themselves of itand grow any quantity of fodder? I see no reason why they should not; it is the very thing we want. Water supply to selectors.

9385. Have you any idea as to what would be the increased value of the land if we could get irrigation? The increase would mainly depend on the supply of water. Value of land.

9386.

Mr. G. Sides. 30 July, 1885.

9386. I mean if there was sufficient for irrigation? My opinion is that it would double the produce of the land.

9387. Then its value would be doubled? No, I do not say that, because the expense in connection with irrigation would take off a great deal.

9388. If you put in a crop at present you have no certainty of getting a return? No, we have no certainty that it will come up.

9389. Then irrigation would double the value of the land? Not at first—it would take time to prove it.

9390. If you had a market for your produce, and it would pay to grow corn, do you think that then it would double the value of the land? In case of mills and other things being provided it would become more valuable.

Water-rate.

9391. *Mr. Donkin.*] If you could get 20 bushels per acre would you be willing to pay £1 an acre? No; when the wheat was produced it would be worth only about 3s. a bushel, so that I do not see where the profit would come in.

9392. *President.*] I suppose it would be worth about 10s. an acre? That would be about it.

Irrigation.

9393. *Mr. Donkin.*] You have seen irrigation on the south side of the Murrumbidgee? Yes.

9394. That was for grain stuffs? Yes.

9395. Did it answer perfectly? That was only with water taken from a well.

Grasses.

9396. Which would it be advisable to cultivate, natural or artificial grasses? I think it is a great mistake to attempt to cultivate artificial grasses; unless it is done extensively it is better to have natural grasses.

9397. You think the natural grasses are more remunerative? Yes, in the long run.

Mr. T. F. Patterson called in and examined:—

Mr. T. F. Patterson. 30 July, 1885.

9398. *President.*] You reside at Eulonga Station? Yes.

9399. Is that far from Hay? About 30 miles north.

9400. It is plain country I suppose? Yes, similar to the country about Hay, even flatter.

9401. Is the land good? Yes, clay land.

Loss of stock.

9402. Have you suffered much from the last two or three dry seasons? Yes, and the losses of stock have been very great.

Wells.

9403. Have you any wells? Yes, we have four salt wells and three tolerably good ones.

Salt wells.

9404. What depth are the salt wells? From 75 to 80 feet.

Depth.

9405. You do not use them? No.

9406. What depth are the others? From 110 to 130 feet.

Rise.

9407. When you struck the water did it rise in the shaft at all? Yes, from 38 to 50 feet.

Source.

9408. Do you conclude that the supply of water is local? It must come from somewhere; you can see it running.

9409. Which way? The same way as the river, from east to west. When you strike the water you can see it coming through the shaft in a small stream. I have stood at the bottom of a shaft for hours and seen the water running through it.

9410. Do you think it has any connection with the rivers? I do not think so.

Channels.

9411. In striking the water do you find that it has a defined course, or do you find it promiscuously over the plains? In courses or small channels—promiscuously on the plains.

Quality.

9412. It has not one single course? No; I have sunk a well in one spot and found salt water, and 9 yards away the water has been better, thereby showing it has several courses and qualities on the same level.

9413. Would not that show that the good water runs in one channel? I think there are various water-courses, some salt and some fresh.

Channels.

9414. Do you think that there is a general drift of water in the whole plain, or that it runs in channels? It runs in channels. You either strike the water or you miss it altogether. You might put down a number of trial shafts without striking water.

9415. The good water is lower down than the other? Yes, from 35 to 50 feet, but in a similar kind of stratum-drift.

Good water.

9416. In what stratum do you find the good water? In sand drift. We get into clay, then come to a sort of sandy rock consisting of cemented sand.

Strata.

9417. The last witness said that it was sand in which the water was found, but sand which the water could not get through? Yes, there are wells like that; sometimes the sandy rock is just above the drift containing water, but not always.

9418. Have you passed through hard rock? No.

9419. Has the mortality of stock been due to want of grass or want of water? To want of both; there has been no growth of grass in consequence of the want of rain.

Growing fodder.

9420. Do you think the water would be much used if the people could get it for irrigation purposes—for growing fodder for the stock? Yes, I think it would to a considerable extent.

9421. Do you think it would be possible to keep stock alive for any length of time by storing forage? I think it would be possible to materially assist their existence by a very small assistance of artificially grown fodder.

9422. You have had practical experience of it? No, I have had no experience of it myself. When the paddocks are poor they assist their carrying capability in parts of Victoria by spreading hay.

9423. Do they grow the fodder? Yes, and they distribute hay or straw as just described.

Steam plough.

9424. I think that on the station you speak of they use the steam plough? Yes, a six-furrow plough.

Crops.

9325. And they put under crop some thousands of acres each year? They have 800 acres under wheat this year, and 500 acres under hay. They purpose cropping for two years, and then laying down lucerne, and if the lucerne succeeds they anticipate a large result. In some good land the lucerne tried in this way has proved a failure, because the land being so good has thrown up so much natural grasses which have choked the lucerne. At East Liddon, Victoria, they are trying a poorer land now—plain country.

9426. With the fodder which is grown they are able to keep stock alive? It is not a question of keeping them alive; they are able to keep them in better condition.

9427. Is it considered that the system pays? Yes; the straw they use there as fodder. There are straw stacks all over the station.

9428. What sort of country is it there? It is like the Deniliquin country, but stronger soil I think. Mr. T. F. Patterson.
9429. Have you any idea of the cost per head at which the stock are kept. No.
9430. They do not irrigate on that station, do they? No, they do not.
9431. Do you think it would be possible by the use of extensive machinery to do on stations in this country what has been done at the place you speak of? I think it could be done. In order to secure anything like irrigation we must have plenty of water. The rivers want locking or damming every few miles—the Lachlan every 2½ or 3 miles; if this is done it will irrigate itself. 30 July, 1885. Irrigation.
9432. And the water if available would be used for irrigation purposes? Yes.
9433. And the people would be prepared to pay a fair sum as a rate? Yes, I think so. Water-rate.
9434. What do you think would be a fair sum? I could not give you any idea.
9435. Have you any tanks? Yes. Tanks.
9436. What is the depth? 6 to 8 feet.
9437. How long do they generally last? We have tanks that last twelve months for 5,000 sheep. Supply.
9438. Does much of the water go away by evaporation? I do not think so, but the wind in this flat country wastes floods of water. The country between the Murrumbidgee and Lachlan, from Hay to Booligal, is so level that the water on the plains will almost run whichever way the wind is blowing. We excavate the tanks in the form of a square, and the earth is put round them in a sort of embankment a chain and a half away. We pump that full. The wind, however, plays upon it considerably. Waste.
9439. Do you think it would be of much service for stock purposes if the water were distributed on an elevation so that at any time you could supply your tanks? I think that would be a very costly arrangement; I do not see how it is practicable; you could irrigate close to the river. I think that the principal object to be gained is to provide water for irrigation to a considerable extent. The water is the all-important question. This must first be stored before you can consider irrigation. Distribution.
9440. *Mr. Donkin.*] Do you think it would pay to irrigate the land to raise natural grasses? I do not think so. Natural grasses.
9441. It would have to be cultivated? I think so.
9442. Have you known any instances in New South Wales? They are doing it at Groongal and Cooba.
9443. Will lucerne or artificial grasses pay for irrigation? I can hardly say; I do not see why they should not; you can get a very good crop of lucerne. The climate here (Lachlan) is one drawback to any cropping. Lucerne.
9444. Do not you think it would pay in dry seasons to cultivate? You cannot cultivate in dry seasons, for want of the needful rainfall. I have a crop in this year for hay (wheat), and expect a like result to last year and years previous—not worth cutting; there is a limited supply of water, as the river is not dammed sufficiently. Crops.
9445. They have never been prevented from doing that? They have not; Mr. MacFarland has attempted it. I consider the scarcity of water has been the chief reason it has not been done.
9446. There has been no scarcity of water so far, but many have expended large sums of money—I heard of £10,000 being spent to provide feed: would it not have paid better to have tried irrigation? Yes, but no one anticipated these continued dry seasons, and they had not made provision.
9447. *Mr. Gipps.*] Has there been any failure of crops on the Loddon farm? No, they have had particularly good seasons the last two years. Loddon farm.
9448. What is the average rainfall there? From 15 to 22 inches. Rainfall.
8449. *President.*] Do you think it advisable to throw dams across the Lachlan at various points? Yes, it is indispensable; we are now obliged to do it at our own risk. Damming of Lachlan.
9450. And it does no harm to the persons below, because it does not intercept the flood-waters? No; I consider every man who builds a dam on the Lachlan a benefactor to his neighbour below, because he stores water that would otherwise go to waste, and when the river does run it requires less flood-water to run it through.
9451. And you find that they stand? Yes.
2452. What do you make them of? Earth.
2453. You said that you have to do that at your own risk? Yes.
9454. Then do you consider that legislation should take place to give power to do this, because persons below might come and destroy your dams? They have done so several times. Legislation is absolutely necessary on many streams like the Lachlan and Billabong and many others I could mention. My experience dates since 1859, and I could tell many a story *re* dam-cutting. Legislation.
9455. And if a succession of dams were made, you would always have a large storage of water in the bed of the river? Yes. Succession of dams.
9456. Do you think the Lachlan would be much interefered with by a portion of the flood-waters being diverted into the Willandra Billabong? It would depend on where it was done. If it were compulsory that every holder of land with a frontage to the Lachlan put a dam up every 3 miles, then nearly all the flood-waters could be diverted into the Willandra without injury to any one. Diversion into Willandra.
9457. Supposing the flood passes down and fills up the dams, that is all that you require? That is all that we require.
9458. If the water was not intercepted so as to prevent that, no harm would be done? None whatever.
9459. *Mr. Donkin.*] Do you think overshot dams would do? They might be tried, if placed close enough together, but I think they put them too far apart. I have never seen one that did succeed. I do not see any difficulty about overshot dams as long as you put them close enough together so that water falls upon water. I would suggest that a Board of proprietors be formed of those interested, squatter or selector, to regulate the height and fix the places for the dams. The Chairman of the Land Board, or Police Magistrate, or Inspector of Stock, or District Surveyor, might be Chairman of such Board, with every Land District to have its own Board, because different portions of the different rivers require different management. While 3-feet dams would suffice in some places, 6-feet dams in others would be useless; hence the difficulty of legislating on the subject. Overshot dams. Boards.
9460. If anything of the kind were done, do you not think it should be done in a systematic way, without regard to either squatters or selectors or any one else: not only are those persons to be considered, but the Government have to look after their estate; and if anything were to be done, would it not be better to have it done by elective Trusts? I dare say it would; I am afraid, however, that it would take a long time to get that; the other we could get at once. Give us a Water Board at once, and, when necessary, elective Trusts. Trusts.

Mr. T. F. Patterson. 30 July, 1885.

9461. Your proposition is that there should be some local body created for the purpose, to erect and look after these dams? Precisely. Different parts of the country require different dams. Further up the river they want them bigger; further down they want them smaller.

Silt.

9462. *Mr. Gipps.*] Is there much silt in the river in flood-time? No; the only silt observable is that from the dams being cut.

9463. The dams must be silting up the bed of the river, according to that? They are to a certain extent, but it is only from the fact of their being cut. The earthwork of the dam is carried down the stream, and it causes silting to go on down below. Consider how few dams are on the river to the hundreds of miles of river.

9464. *Mr. Targett.*] You do not find your dams shallowing the stream above them? No.

9465. Then there cannot be any silting? Only when the dams are cut.

9466. *Mr. Gipps.*] Are there any dams in existence now in the Lachlan? There are.

9467. And is there any appearance of silting in the upper part? No, none.

FRIDAY, 31 *JULY*, 1885.

Present:—

At Hay.

MR. DONKIN, J.P., | MR. LYNE, M.P.,
MR. GIPPS, C.E., | MR. TARGETT, M.P.

W. J. LYNE, ESQ., M.P., PRESIDENT, IN THE CHAIR.

Mr. Warden Harry Graves called in and examined:—

Mr. W. H. Graves. 31 July, 1885.

9468. *President.*] You reside in Sydney? At present.

9469. Have you resided in Riverina at any time? Yes, for some years—from 1857 until about 1872, constantly.

9470. You were in Riverina during the heavy floods of 1870? I was.

Floods.

9471. Will you state what you know about the floods of 1864 and 1870? I came down the Lachlan in 1864; I rode from Queensland; I came by Forbes, and came right down the Lachlan; when I got to Forbes I was informed by several people that it was impossible to ride down the Lachlan country, as it was all flooded; however, I said I would try, and I started; I worked about 40 miles below Forbes, to a place called Mulguthrie, I there found the Lachlan breaking over its banks in a wide stream on the nearest bank, and I had to keep going out towards the Bogan, to head the watercourses; in fact all the plains were under water from the Lachlan 40 miles below Forbes; all the billabongs and creeks were full, and water was running over the plains for miles and miles in the direction of the Bogan; I rode down parallel to the Lachlan to Booligal, about 50 miles from here; I am not sure whether it was in '63 or '64; to the best of my recollection it was in '63. In many portions of that journey I was not within 10 miles of the Lachlan; you could see nothing but water; I think I am within the bounds when I say that every day I had to swim some billabongs or creeks which in ordinary times would be only dry watercourses; even when I got to Booligal, coming in the direction of Hay, the Lachlan was out quite 3 miles.

9472. That is on the north bank? On the south bank. I was in Riverina in the flood of 1870; at that time Cobb's coach going from here to Deniliquin could not get within 12 miles of the township of Deniliquin about 4 miles from the Edwards River.

9473. How did they get into Deniliquin? They went by boat from a place called Pretty-pine, about 3 or 4 miles from the river; it was 12 miles from Pretty-pine to the township, but they went parallel to the river. Deniliquin was all flooded that year except the "Royal Hotel," the Gaol, and the Court-house; boats were coming up the streets; that flood was from the Edwards, which comes out of the Murray, about 25 miles from Deniliquin, and somewhere about 25 miles from Echuca; it comes out about halfway between Moama and Tocumwal. In the flood of '70 the water went all over Deniliquin Plains for miles and miles, and on Sir Patrick Jenning's Warbreccan Run; in fact the banks of the river are higher than the plains, and once the water is over the banks, the country is so level that the water runs out for miles and miles.

9474. Does it go all over the plains, or follow the watercourses? It follows the watercourses, which are very shallow; then it goes all over the plains for miles and miles, perhaps 3 or 4 inches deep. In that year the coaches could not get into Deniliquin coming from the Melbourne side; they had to take the horses out and swim them; the same thing occurred to the coaches coming from the south side; they could not get anywhere near the town, except on a sandhill; you could not get within 3 or 4 miles of the river anywhere.

Utilization of flood-water.

9475. In times like that, when the floods are so high, if the banks were cut and shallow channels formed in various directions, could not the water be diverted as required, to fill up the dry lakes, billabongs, and reservoirs? Yes, if you have the supply you can take the water anywhere.

9476. Do you know anything about the Murrumbidgee? Yes. I was coming up from Deniliquin about 1863, and I suppose there were quite a large number of people in a camp on the south side of the river for nearly a week; they could not get across the river with horses; the whole place was under water for 3 miles.

9477. I suppose that what I have said with regard to the Murrumbidgee would also apply to the Murray, that is, as to the utilization of the water? There would be no trouble if the flood-waters were diverted.

9478. And the same with regard to the Lachlan? The same there.

9479. Do you know how far the water went out towards the Darling in 1870? Not of my personal knowledge; I heard a great deal about it; the coach contractor at Booligal said that in the first 10 miles he had nine creeks to swim in going north, and that the water was out for at least that distance.

9480. What I was coming to was whether you know that the waters of the Darling and the Lachlan meet? I have heard of it, but I have not seen it; I know that the two rivers have met; the Macquarie, the Castlereagh, and the Barwon have all met.

Merool Creek.

9481. Do you know anything about Merool Creek? Yes.

9482. Do you know whether the waters of the Murrumbidgee went into that creek in 1870? I am sure that they must have done so, although I did not see it.

Dams.

9483. Have you had any experience of dams in the beds of these rivers, the Lachlan and the Edwards especially? Yes, I have seen lots of dams in the beds of the rivers, and in the billabongs particularly.

9484. Was there any difficulty in getting the dams to stand in the beds of the rivers? Oh yes, there is great difficulty. Mr. W. H. Graves.
9485. Would it be practicable to put overshot dams in the Lachlan? I think so. 31 July, 1885.
9486. In your opinion, would it be a good plan to throw dams across at various points in the rivers to keep the channels constantly filled? I think it would be an admirable plan; I have no doubt of it whatever. I can remember the time when there was no water in the Billabong; most of the water has been made permanent through damming entirely. The less frequently floods come down the river, the more porous the land becomes. I can recollect the time when there was only water for about 6 or 7 miles in the holes in the Billabong; were it not for dams there would be very little water.
9487. Were it not for dams in the ana-branches of the river the country would be in the same state as it was twenty years ago? Yes, there would be no water there at all.
9488. I suppose from your experience the only thing required to increase the carrying capacity of the country is water? That is all.

Mr. John Dill called in and examined:— Mr. J. Dill.

9489. *President.*] Have you been long resident in this part of the country? I have resided in the Riverina District for the last twenty-five years. 31 July, 1885.
9490. In what part of the Riverina do you reside now? On the Murrumbidgee, about 2 miles down the river, at Toogimbie.
9491. Have you attempted to carry out any system of distributing water from the river for irrigation? No, but I am just starting at that work. Irrigation.
9492. By what means? By the use of a powerful engine and a centrifugal pump. Pump.
9493. What quantity of water will it throw? About 5,000 gallons a minute. Force.
9494. Do you propose to irrigate? Yes.
9495. What extent of country? It depends upon what quantity of water the soil will take. It is impossible to say; it is more an experiment than anything else.
9496. What kind of soil is it you are intending to irrigate? It is a remarkably porous soil at any time. At present it requires an enormous quantity of water—it requires to be flooded. Nature of soil.
9497. Is it a loamy soil? Yes.
9498. Not the ordinary chocolate plain? No.
9499. Do you intend to distribute the water on the surface or to allow it to flow in channels? I intend to allow it to flow over the surface. Distribution.
9500. Are you preparing the land? Yes, by draining.
9501. What do you anticipate will be the cost of the work? As it stands, the cost is about £1,000. Cost.
9502. Before you are able to commence pumping? I am pumping now, but I reckon that it will take considerably more than I have expended.
9503. You have had no results? No, none to speak of.
9504. Have you plenty of water? Plenty at present, but there will not be at the end of the summer. Supply of water.
9505. But the water you take out of the river will not affect the supply, will it? No, I do not think it will do that.
9506. Why do you think there will not be water enough at the end of the summer? The pump would not do the quantity of work; it would have further to lift the water when the river is nearly dry. When the river is full the pump can do double the quantity of work. Capacity of pump.
9507. What height do you draw the water? 35 feet.
9508. But the pump will not suck more than 28 feet? It is not a perpendicular lift—that is about 20 feet.
9509. You say that at the end of summer there will not be sufficient water in the Murrumbidgee, but you mean that there will not be sufficient to enable you to pump in your present position: if you were to alter the position of your pump there would always be sufficient water, would there not? I anticipate being able to work the pump all the year round, but I am only making a start now.
9510. Does the Murrumbidgee become very low in summer-time? During the last dry season it has become very low. State of Murrumbidgee.
9511. Do you think the bed of the river could be filled by damming it? I feel sure it could. I think that the erection of a system of flood-gates on the Murrumbidgee would be a boon to every one from Narrandera down to Wentworth.* Damming.
9512. It would stop navigation, would it not? Not necessarily so.
9513. It would unless you had locks? Of course you would want locks.
9514. But suppose that locks were not constructed, do you think the navigation so important that it should prevent the river from being dammed? I do not. I think the water is of more importance than the navigation; therefore the river ought to be dammed or locked. It requires a practical man to give an opinion on this matter—some one used to this sort of thing in America. I have simply given my opinion. Importance of navigation.
9515. If there was another stream equal to the present stream of the Murrumbidgee thrown down the river, would there be plenty of water at all times for carrying out a reasonable amount of irrigation? I think so. Supply.
9516. Do you intend by means of your irrigation to grow crops for fodder or to grow grain produce? We intend to grow produce simply for our own consumption—not to any large extent. Crops.
9517. If you had plenty of water, do you think it would be possible to grow fodder to any great extent to keep your stock alive in dry times? My own opinion is that it would not pay. I think fodder can be grown so very much cheaper under more favourable conditions that it would not pay us. Fodder.
9518. Do you think that fodder can be grown in mountainous country and delivered here cheaper than you can grow it here? Yes, I do. If I only anticipated growing crops I should not have gone to any expense at all; I should never dream of going in for irrigation merely for cropping.
9519. I suppose it is a question with you whether it would pay or not? That is a question.
9520. But it is possible to do it? Is is quite possible, and my own opinion is that it will pay us to irrigate. I do not think it would pay to buy an engine for the purpose of growing crops, but it will pay us to use irrigation for our purposes. 9521.

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* Note (*on revision*):—My evidence was that I considered it could *not* be dammed, but that locks could be erected or should be. I still consider the water the paramount question.—J.D.

Mr. J. Dill. 31 July, 1885.

9521. What I mean is, to grow fodder to any large extent: suppose you put in 2,000 or 3,000 acres a year, do not you think you could then tide over the bad season—would it not pay you? No, I do not think it would.

9522. Have you had experience of feeding stock on hay and lucerne? No; but I am acquainted with what has been done by others, who have admitted to me that it does not pay.

Irrigation. 9523. Do you think it would pay to irrigate for grazing purposes? I do.

9524. What would be the difference between 10 acres of land irrigated and the same area unirrigated? The difference would be very great. It would be at least five sheep for one with a certainty in one case, and with no certainty at all for the five sheep. It would certainly be four to one—I believe it would be five to one.

9525. In the one case with a certainty, and in the other without? Yes.

9526. Witnesses have told us that if you put water on the country at certain times of the year you can get a most luxuriant growth of grass? Yes.

Diversion. 9527. Do you think it would injure the residents lower down the river to divert a portion of the flood-waters of the Murrumbidgee? I do not think it would injure them if a certain portion of the flood-waters were diverted; but I think it is a matter that requires very careful consideration. I think that diverting anything but the flood-waters from those lower down would be a very dangerous policy—the flood-waters are the greatest possible boon to us.

9528. But supposing the flood-waters were diverted and the river were dammed at various points to keep it full, do not you think that the compensation resulting from keeping the river full would be far more than the losing of the flood-waters? There is a great deal, no doubt, about that.

9529. And if such a stream as the Snowy River were thrown into the channel, do not you think it would be an equivalent? Yes, I do.

Banks. 9530. Do you think it is possible to dam the river, and that the banks are of such a nature that the dams would stand? I do not think a dam would stand.

9531. Not an overshot dam? No.

9532. Are there no bars of rock? Not down here—I don't know of one; there is no bar as far as Balranald.

Dams. 9533. I suppose it is a question of engineering skill as to whether a dam could or could not be put across the river? It is. I have had a great deal to do with dams, almost from my boyhood. I have seen a great many dams carried away even in small creeks, and although the structures were apparently strong. I think that the erection of a dam would be a very costly matter and a very risky undertaking.

Engine. 9534. *Mr. Donkin.*] You said you were working an engine? Yes.

Power. 9535. What size? 20-horse power.

Pump. 9536. What size is the pump? 15 inches.

9537. Have you calculated what will be the cost of irrigation per acre? No, I have not. That is a thing which it will be very difficult to arrive at.

9538. You said you felt certain that it would not pay as a speculation? No, I did not say that at all. I said I did not think it would pay to buy an engine and pump for the purpose of growing fodder alone, except to use it both for irrigation, for grasses, and all sorts of fodder.

Merool Creek. Billabong. 9539. You were speaking in reference to the Billabong and Merool Creek? I have had a pretty long experience of both. I was on the Billabong years ago; there was hardly a dam on it. The creek in summer-time would be useless without dams. Their main supply is obtained entirely by securing the water during flood-time.

Dams Overshot. 9540. What sort of dams will stand in the Billabong? They are clay.

9541. Do not you believe in the construction of overshot dams? Yes; in overshot dams there is no water wasted.

9542. Of course you are aware that two overshot dams on the Culgoa Creek were carried away? Yes.

9543. Your opinion is that they will be best constructed in such a way that they will stand and cannot be carried away? Yes, I believe they can be in ordinary creeks or small streams, but in such a river as the Murrumbidgee I think the expense of an overshot dam would be great and the risk of being carried away great.

Diversion into Merool. 9544. Do you think it is possible to divert the water from the Murrumbidgee into the Merool Creek? I hardly see how it is possible; I think the expense would be too great.

9545. We have had evidence that in flood-time it was carried down the Merool Creek? I think that is entirely a mistake. It would have to run up hill all the way to the head of the Merool. By taking the river water from about Gundagai across to the Merool the latter could be filled, but the expense would be enormous—below Narrandera it could not be done.

9546. You said you did not think it would pay to store forage to feed stock in time of drought? No.

9547. Have you tried the system of ensilage? No, I have not; I have heard of its being tried.

9548. Do not you think that low overshot dams, 6 or 8 feet high, on the Murrumbidgee would stand? No, I do not; I have grave doubts about it.

Banks. 9549. Are the banks not 20 or 30 feet above summer level? 20 feet at least.

9550. And do you think that overshot dams 6 or 8 feet above summer level would cause such an obstruction that they would be carried away? Yes; lower down and even here the banks of the Murrumbidgee are of such a crumbly nature that they would be easily washed away.

9551. If the overshot were made with an apron 2 or 3 feet lower than the sides the water would fall in the centre? Yes.

9552. At what rate does the river run? I hardly know; I think at the rate of 3 or 3½ miles an hour.

9553. You do not know that the system I suggest has ever been tried? No, I do not.

Natural grasses. 9554. *Mr. Targett.*] You propose to irrigate for natural grasses? Yes.

9555. Have you a very large area which could be reached by irrigation? On our frontage country we can remove the engine up and down the frontage.

9556. Do you propose to cultivate many natural grasses? Yes.

9557. Do not you think it would pay to grow fodder by means of this irrigating plant, such as lucerne, which could be cropped without gathering it in? It is a test with me; I am only trying what can be done, and I have not yet ascertained what is best.

9558. It stands to reason that the cost of harvesting is very large, and if you can feed your sheep straight from the ground your expenses would be very much less than if you stored fodder? Yes. Mr. J. Dill. 31 July, 1885.

9559. Do you know of any case in which an effort has been made to dam the Murrumbidgee? I do not know that such a thing has ever been thought of.

9560. You have spoken about the friability of the banks below Hay? Yes; higher up it is not so bad. Banks.

9561. *Mr. Gipps.*] What kind of pump do you use? A centrifugal. Pump.

9562. What is the average discharge in eight hours? So far it has not been worked above 4,500 gallons. Discharge.

9563. From what lift? About 18 feet. Lift.

9564. And what is the cost of running it eight hours, including engineer's expenses, fuel, and everything? It is simply a test. I reckon it will cost £500 a year; I may be a little out in my estimate. Cost.

9565. Still you are working on figures now? Yes.

9566. What quantity of water do you throw on per acre? That I have not yet ascertained. The engine has not yet been tested even for twenty-four hours; it has only been going occasionally.

9567. You said you could not advise the diversion of the Murrumbidgee except in case of floods: do you know the discharge for every foot of height? No. Diversion.

9568. Supposing the discharge were equal to 800 cubic feet a second, would it not be a pity not to use the water to the greatest height possible? I think so. Discharge.

9569. Then you think we ought to take as much advantage of the water in the Murrumbidgee as possible? Yes, I certainly do. That is one reason why I have gone in for an engine and pump.

9570. *President.*] Was any attempt to carry on pumping made by your predecessor? Yes. Pumping

9571. What was the nature of it? He got an engine and pumped, and tried to carry the water back by flumes and drains.

9572. What horse-power was the pump? I could not say; it was only a small pump. Power.

9573. Did he succeed? No. Result.

9574. What was the reason of his failure? It was principally owing to the want of proper levels and the smallness of the pump; the pump was unsuitable for the purpose.

9575. Do not you think that, before entering upon any irrigation work of this kind, a person going into it on a large scale should have the ground thoroughly levelled and everything put on a proper basis before he starts? Yes, I do. Levelling.

9576. He should not go into it as some have done, in a haphazard sort of way? I quite agree with you.

9577. *Mr. Gipps.*] Who is the maker of the pump? Robey, of London. Pump.

9578. Has it any steam injector attached to it? That I could not say.

9579. *Mr. Donkin.*] How do you start it—have you to fill it with water or do you inject steam? It is filled with water in the first instance.

9580. *Mr. Targett.*] Have you irrigated for garden purposes? Yes, in a small way. Garden irrigation.

9581. With good effect? Yes.

9582. Have you trees old enough to judge of the results? Almost every one on the river has a garden dependent on irrigation.

9583. Fruit grows well, I suppose? Yes. Fruit.

9584. *President.*] Is there not a watercourse going out of the Murrumbidgee on your run where water goes in flood-time towards the Edwards? I am not aware of it myself, though I imagine that the flood-waters would go across from the Murrumbidgee to the Edwards.

Mr. John Dill recalled and re-examined:—

9585. *President.*] I understand that you wish to give some further evidence? There are one or two things I forgot in speaking of the creek that runs out at Toogimbie Station. We have two dams on that creek. After a flood these dams would last (say) from nine to twelve months, but it is the thorough soaking the ground gets that causes the water to remain so long. The soil is of such a porous nature that after an ordinary rain the water disappears altogether; for instance, I attempted without prospecting to make an excavation at the back of a dam, and after going 2 feet from the surface I got coarse drift sand in the bed of the creek. Mr. J. Dill. 31 July, 1885. Soil.

9586. That leads you to suppose that there is a drift running out towards the Edwards? Yes. Drift.

9587. And that, as a matter of fact, the Murrumbidgee is losing a large quantity of its water? Yes. Another matter I wish to mention is this: the flooded land I suppose extended for 30,000 or 40,000 acres, and when we purchased, it was thrown out as a great inducement to us that this country by being flooded by the Murrumbidgee would carry more stock than might otherwise have been expected. It was stated that it would carry a sheep to an acre, or an acre and a half, but as it has been for the last four years it takes 6 acres to carry a sheep, and last year 20 acres would not support a sheep; indeed I had to take all the sheep away. I had only 3,000 sheep on the whole of our frontage last season. My reason for referring to this is, that when I said I would not object to the water being taken out of the river I did not think it would injure those lower down the stream by the surplus water being taken away; that is, a certain portion of the water, not the diversion of the whole of the flood-water. Waste. Flooded land. Sheep per acre.

9588. Do you think that sufficient reason for not making a great deal of the back country of the Colony available for occupation? No, I do not.

9589. Because the diversion of the flood-water would mean that an immense area of Crown Lands would be made available by means of water? Yes. Crown lands.

9590. You do not think that the fact of two or three stations depending on the flooding of their land would be a sufficient reason for the Government ignoring those large tracts away from the river to which I refer? No, I should look upon that as a dog-in-the-manger policy; but those on the river have a great deal at stake, and should be considered as far as possible. I think those lower down have a right by purchase to the flood-waters; hardly any one down here and lower towards Wentworth would have bought but for the prospect of flood-waters. Right to flood waters.

Mr. Robert Wilson Ronald called in and examined:—

9591. *President.*] Where do you reside? Nap Nap. Mr. R. W. Ronald. 31 July, 1885.

9592. I think you particularly wish to give evidence? I wish to put before the Commission the nature of the country down our way, which is apparently a peculiar country.

Mr. R. W. Ronald. 31 July, 1885.

9593. Will you describe it? It is composed of what we call lignum swamps—not swamps, but a series of creeks one after another, with hardly any distance between them. You go half a mile and you find a creek; then, a short distance further on, two or three more within 100 yards of each other; then you go further and you find a similar state of things. It is below the level of the river bank. I have not been very long in the district, but one year it was all under water, except at very high points. The lignum country is such that unless it were levelled all the water would simply run down the creeks.

Lignum swamp.

Soil.

9594. What is the nature of the soil? It apparently expands and contracts with the moisture and heat. To show what I mean, when the dams are dry and the ground is exposed to the sun the banks crack, and the cracks go right through; the soil is like soap—it melts in the water and will not settle. We find that at high-flood times the banks will not stand—they are bound to go.

Cracks.

9595. Is that so with the dams on the ana-branch? Yes; there are big cracks in the dams, and we have to be constantly doing them up. It is not so much the dam itself sometimes as where it joins the sides.

9596. It breaks away around the ends? Sometimes it goes right through the crack, being in the middle of the dam. In enlarging the capacity of the dams we have often come upon drift sand and white sand.

9597. Is the surface soil retentive? Once it is soaked, but it has such cracks that for hours you will see the water running down through them.

9598. Then that would show the necessity of always keeping the dams tolerably well filled? Yes.

Extent.

9599. What extent of country is there from the river? From 80,000 to 100,000 acres of flooded country.

Floods.

9600. Does it require a high flood to cover much country? Yes. We have not had a flood since the last great flood to do much more than flood the immediate neighbourhood of the river and to run into some creeks. The last flood to cover most of the lignum country was in 1879.

Irrigation.

9601. Have you attempted to irrigate at all? We have not.

Pumping.

9602. Have you pumped water from the river? We have for garden purposes.

Result.

9603. With what result? Very good results, with plenty of manure.

9604. It produces everything you require? Yes.

Damming of Murrumbidgee.

9605. It is said that from the porous and peculiar nature of the soil it is necessary that the tanks should be kept filled—do not you think that that could be accomplished in a great measure if the body of the Murrumbidgee were kept fairly filled by means of dams which would keep the water at a certain height—would you not have water oftener then? I expect that the dams would break away; that would be the difficulty which would have to be contended with.

Tank-filling.

9606. You say that the country away from the river is lower than the river banks—if, then, the water was kept fairly up to the banks of the river, means could be adopted by which you could fill your tanks whenever you chose? We do not depend upon the dams for the supply; the dams we put on the creek are simply to get the water if we can. The actual bank of the river forms a lip, and the fall behind that is so slight and the ground so cracked by exposure to sun that a year or so back, after a slight rise in the river, and when it began to fall, it took water a fortnight to run 6 or 7 miles along the creeks.

9607. If you could get the tanks filled in that way would it not make the country much better? If we could rely on them being always filled we should have the flood-water over the lignum country, but I do not think the water itself would be necessary. We do not rely on our dams on the lignum creeks for permanent water. Our tanks on hard ground filled by rain-water are our standby, together with our wells.

Stock.

9608. The more the water is distributed the more stock you can carry? Yes; but we find that we have no difficulty in catching rain-water; we have these hard plains interspersed with this country, but one corner of our run is quite a dry country.

Gum Creek.

9609. Does water break out of the Murrumbidgee and go towards the Edwards? Yes, by Gum Creek—I think that is the name of the creek; in 1870 it ran and joined the Edwards.

9610. Where? Below Moulamein. It has evidently been a river, channel or an important channel of the river, at one time; wherever we have sunk there we have always come upon pure sand; we have tried to sink tanks there several times.

Lakes.

9611. Are there any deep indentations in the shape of lakes on your property? Yes, there are swamps which we think could be filled.

Depth.

9612. What depth of water would they contain? I should say you could fill them to at least 10 feet—I dare say more; there are higher parts of ground alongside; I do not know how the levels are.

9613. Have you carried out any works to fill any of these reservoirs? No, there is only one which I think would be of any importance.

Water storage.

9614. Have you made provision for the storage of water except by dams across small creeks? No.*

Diversion of Murrumbidgee flood-waters.

9615. Do you think that the diversion of a portion of the flood-waters of the Murrumbidgee at any point would be injurious to those residing down the river? I think it would be injurious to us; we are so dependent on the flooded country for feed, and if that country does not get flooded or there is not very heavy rain—and as a rule a flood follows heavy rain—there is very little grass at all; there are many acres there which would not carry a sheep.

9616. If that is conceded, nothing ought to be done to interfere with the flood-waters higher up? We should not approve of any diversion of the flood-waters.

9617. But as a national question do you think it is desirable that the flood-waters should be allowed to run to waste as they are doing at present? If they could be stored with advantage to everybody it would be much better to do so.

9618. You say that you are dependent upon flood-waters for the growth of grass, and if the waters were diverted they would not run over your property? Then we should suffer; we do not get a flood every year.

9619. Do you think that that is a sufficient reason why the flood-waters should not be diverted? In my opinion it is, but it is a personal matter with us there altogether; when I went into the station it was on the strength of the floods that I had anything to do with it.

Yanko Creek.

9620. You have heard of the proposal to divert water from the Murrumbidgee into Yanko Creek? Yes.

9621. Do you think that that would interfere much with the flow of the river? I think it would. The river is very low in summer; we hear reports of its having been dried up once, but that was a very long time ago; a man could walk across it without wetting himself up to his middle in the summer-time.

9622.

* Note (*on revision*):—The answer to this question is not correct, as we have excavated a large number of tanks on hard dry ground, besides five wells which were sunk before I came on the station.—R.W.R.

Mr. R. W. Ronald. 31 July, 1885.

9622. Do you know the quantity of water which would be diverted into the Yanko by the carrying out of such a project? No; if it is a matter of pumping I do not think there would be any harm in it; I cannot approve of any interference with the channel. I understand that something was done with the Yanko years ago; whether that made any difference I cannot say.
9623. Suppose that not more than 1-125th part of the water were diverted at any time from the river, do you think that that would interfere materially with the flow of the water? No, I do not.
9624. That is actually the proposal—you do not think that that would do any harm? No.
9625. Provided that the river were kept full by dams all the way down, do you think that that would be an improvement on the present state of things? I do not see where the improvement would come in; we should only use the river for watering stock, and we do that now. Effect of use of water on state of river.
9626. Supposing there were others who used it for irrigating purposes, for the production of grass or fodder, do you think that the conservation of so much more water would be for the benefit of the people residing along the river? I doubt whether they could pump enough out to make any great difference in the river.
9627. Supposing every station erected machinery? I don't think that one pump at every station could make any difference.
9628. Then you do not object to the pumping which is carried on? No, and certainly the question of navigation is of interest to us, because we get all our supplies up by river; when we have a high flood we cannot get our wool away by river, but when we have a moderate flood we send our wool by the Murrumbidgee. Navigation.
9629. But if at any time the railway to Hay is extended to Menindie or Pooncarie you would not send your wool by water then? Unless we could take it to Melbourne we should send it by river.
9630. Putting the question of navigation side by side with irrigation, do not you think it would be better, rather than not utilize the water at present running to waste, to run cheap railways instead of navigating the river? I think it would be very advisable to run cheap railways.
9631. So that as a matter of fact navigation could be superseded? I do not think you could get railways down our way, certainly not a cheap railway.
9632. The railway must go close to your station? We are on the south side of the river; our shed would be 30 or 40 miles away.
9633. *Mr. Gipps.*] What length of river frontage has your station? 20 miles. River frontage.
9634. What use do you make of this frontage for water supply—do you use the water for stock? The sheep go down to help themselves. The river is also a natural boundary. Use of it.
9635. You only use the water for supplying stock? Yes.
9636. If they were supplied by any other means you would not be under any disadvantage? There is one thing very certain—the sheep do very much better when they take the river water; I do not think they could be supplied in any other way.
9637. Would you be under any disadvantage if they could? I think so; it might not hold in the lake; if you diverted the river altogether there would be no floods—that is where we should lose.
9638. Is the slope of the country towards the river or away from it? Away from it, with a very slight fall. Slope.
9639. You were saying that you could not get the dams to hold: have you any gravel in the neighbourhood? Gravel. None.
9640. Sand? There is that drift sand, and sand lies on the plains. Sand.
9641. How many acres are required to feed a sheep in a good season? 3 at least. Sheep per acre.
9642. In a bad season? About 8 or 10 acres.
9643. Have you suffered much during the late drought? Very much.
9644. Did you lose much stock? Yes. Loss of stock.
9645. Was that due to the want of water or grass? Want of grass totally; we have wells on the station, and we were not short of water at any time. Wells.
9646. What depth are the wells? 70 or 80 feet. Depth.
9647. Do you get good water? Good stock water. Quality.
9648. What is the character of the strata? We have not put any wells down since I came on the station, so that I do not know. Strata.
9649. Is there any gravel or sand in the material thrown up? No gravel; there is a little gypsum.
9650. You always get good water at about 80 feet? Yes, it is good water.
9651. Have you any windmills? We work a windmill for the garden. Windmills.
9652. *Mr. Donkin.*] Have you found the water in any case to be poisonous? No.
9653. How do you raise the water? With whims and buckets. Raising water.
9654. You said that the floods benefited your run to a great extent; you depend upon flood-water then? Yes.
9655. What height is the water above summer level before it benefits you? It must be about 18 feet above summer level at Hay and 25 feet at Wagga Wagga. Beneficial river height.
9656. How would it affect you if water were taken down the Yanko 2 or 3 feet above summer level? We should not object to its being taken 2 or 3 feet above summer level.
9657. If about 1-100th part of the water in the river were taken you would not be at a disadvantage, because in a big flood you must get the water? Yes, it must come apparently.
9658. You said that you strongly objected to any water being taken out of the river? Yes, in an unregulated channel.
9659. That is, you would not like to see the stream entirely diverted? No.
9660. *Mr. Targett.*] You have no regular floods? No, they are not regular at all; we can never calculate upon them. Regularity of floods.
9661. I suppose that the river is never affected much by local rains? No, never at all.
9662. Are you backed up from the Murray at all? No water comes from the Murray.
9663. I suppose that in the large floods there is such an immense quantity of water coming down that even five or six channels as are proposed at the Yanko would not affect it. No.
9664. *President.*] What is the difference between the carrying capacity of flats flooded and not flooded, one season with another? Some of the country at the end of this summer would not carry a hoof. Carrying capacity of flooded country.
9665. Taking one season with another? That is rather difficult to say.
9666. Have you any idea what stock the land will carry in a flood and when there is no flood for a season? I can only hazard an opinion. I should think that without a flood the lignum flats would not, in a fair average season, carry more than one sheep to 5 acres, and I should think that every acre would carry a sheep after a flood.

9667.

Mr. R. W. Ronald. 31 July, 1885.

9667. Could not those flats be covered oftener if the river were kept full by means of dams? Yes, I fancy that could be done; but then the water might remain up too long for us.

9668. *Mr. Donkin.*] You say that you do not think there would be much advantage in putting up dams—but supposing all the station-holders were to use centrifugal pumps, would that not make a great difference? I hardly think that all the water which could be taken out by means of pumps would make much difference.

9669. Are you not aware that at Winbar Station, on the Darling, they nearly pumped the river dry, and it had to be stopped? There is a good stream down the Murrumbidgee. The difficulty with us is, that the climate is so changeable one year and another that you cannot depend on the state of the river.

Mr. Robert Macdonald, District Surveyor, called in and examined:—

Mr. R. Macdonald. 31 July, 1885.

9670. *President.*] Will you state anything you know connected with the underground water supply on the great ana-branch of the Darling? I saw the works, and wrote a report on them.

Works on great ana-branch of Darling.

9671. What works? The dams, by-washes, and channels, and a vast amount of works that have been constructed there. There is a cutting made from the main river to the ana-branch, and at intervals of about 7 or 8 miles dams were put up and by-washes were made to fill a lot of lakes which exist along the course of the ana-branch.

9672. What means were adopted to divert the water into those lakes? There are small watercourses running from the ana-branch, and the channels were deepened in a great many places, and dams were put below the junction of the watercourse and the by-washes; as soon as the lakes were filled, the by-wash was cut and the water taken on to the next place. The whole management of the ana-branch appeared to be vested in Mr. Cudmore.

9673. Who vested it in him? There are only half a dozen people concerned in the scheme, and I suppose he was appointed by common consent because he arranged everything and worked very hard in connection with the works.

9674. Have you ever been on the offtaking of that ana-branch from the Darling? No.

Receding of water.

9675. Do you know whether the water recedes when the flood goes down? It does—it goes back.

9676. Are any means tried to prevent that? It can be done by deepening, but I suppose that the effort has not been made.

9677. Could it not be done by regulating sluices? I am sure it could.

9678. Is that in your district? Yes.

Crown Lands.

9679. Is there any large amount of Crown Lands that would be made available if Government money were spent in conserving water along the ana-branch? I do not think there is; the only flooded country is the lakes.

9680. Supposing permanent water was made all along the ana-branch, is there any Crown Land that would bring in a return? It is nearly all Crown Land. I do not know that it would bring in a much larger return; it is only grazing country.

Quality of land.

9681. But it is good land, is it not? Very poor; it is low scrub and plain.

Wells.

9682. Have you had any experience of the underground water supply there in the wells along the course of the ana-branch? I have seen wells in the bed of the ana-branch; they were deep wells.

9683. What depth? 80 feet.*

9684. Was it along the course of the ana-branch or away from it? In the centre of the bed of the ana-branch.

9685. The soakage from the river? Yes, I suppose it was.

Quality.

9686. Was it good water? Fair water; it was brackish.

9687. Do you know whether water has been found between the ana-branch and the river by sinking? I do not think it has; they have gone in principally for tanks in that country.

9688. When was it? 27th January, 1881.

Cost of works.

9689. *Mr. Targett.*] Are those works pretty extensive? Yes, I think they are; they cost about £5,000, I believe.

9690. How many station-holders are concerned in them? Three only, I think.

9691. They have largely improved their water supply? Oh yes, immensely.

9692. Are those works permanent now? I have not seen them for five years; I have been away. They have had an awful season since; I imagine, however, that they are not dry.†

Surface of country.

9693. What is the character of the surface of the country between the Murrumbidgee and the ana-branch? It is perfectly level.

Nature.

9694. As regards the soil? A light clay.

9695. Is it retentive soil? Yes.

Slope.

9696. Is the slope of the country towards the lake? There is a very slight slope—it is almost a dead level.

9697. What is the depth of the banks on the ana-branch? It varies considerably, but on the average I suppose it is 15 feet.

9698. What is the length of it between the Murrumbidgee and the Darling following its course? I should think 200 miles; it is very crooked.‡

9699. In what seasons does the Darling flow into it? In September, but only in big floods.

Area of lakes.

9700. Do you know the area of those lakes and the depth? The depth, I should think, 20 feet on the average. The area is 20,000 acres. The area of some of them is even more than that. The Marie Lake is bad holding ground. They ran water out into the Multongay.

Embankment.

9701. Do you think they could raise the water in the lake higher than it is at present? Yes, by an embankment.

9702. And then could they apply that water to irrigation—is there any channel to lead it off towards the Darling? I think not.

Quality of soil.

9703. *Mr. Gipps.*] The soil is not worth much? No; it is very bad and mallee country.

9704.

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* Note (*on revision*):—I find I was in error in stating the wells to be deep; they are quite shallow. The water obtained was the under soakage. I believe that in many cases the wells were less than 15 feet deep.—R.M.

† Note (*on revision*):—I have since learnt that they are nearly all dry.—R.M.

‡ Note (*on revision*):—On reconsideration I think the distance must be nearer 300 miles, but correct information can be obtained from Harbours and Rivers, or Survey Department, as the course has been surveyed.—R.M.

Mr. R. Macdonald.
31 July, 1885.

9704. What is the character of the immediate neighbourhood of the lakes? They are regular basins; on one side the banks are high, on the other the banks are low and ill-defined.
9705. So that there is shallow water on one side and deep on the other? Yes; you can walk half a mile into it before you get up to your neck.
Weirs.
9706. *Mr. Donkin.*] Do you think it possible to conserve water in the Darling by means of weirs? Yes.
9707. Do you know of any rocky beds in the Lachlan or Murrumbidgee that would afford good sites for dams? No, not one.
The Willandra.
9708. You were speaking of the Great Ana-branch as being largely used for supplying water: do you know of any other place where the water could be diverted from the Lachlan to the Darling to advantage? The Willandra would be a good place; water has been pumped into the Willandra before now.

Mr. Thomas Robertson examined:—

Mr. T. Robertson.
31 July, 1885.

9709. *President.*] You have resided in this district a long time? Since 1873.
9710. Have you seen any heavy floods in that time? Yes.
Floods.
9711. Did they cover any extent of country about Toganmain? Yes.
9712. Did it run any distance? It ran on through Gum Creek.
9713. How many miles out from the river? It runs 12 or 14 miles from the river, and a portion of it comes back again.
9714. I suppose that during times of flood you store water by means of dams? I have been storing in every way possible. I have been laying out large sums of money all over the country which I hold.
Watercourses.
9715. Will you describe the nature of the storage you have carried out? I have carried out every plan possible. I can describe it better by means of figures. This plan (*Appendix* FF 1) shows the watercourses by which the water flows from the Murrumbidgee towards the Billabong. I took levels by running water as far as my run extends, with small embankments through the hollows, and plough furrows through the ridges, till joining water running southward—some channels coming from an overflow higher up than Gum Creek.
9716. Do all these watercourses represent actual water in the country? They are only watercourses in flood-time; sometimes they are back water. The main course is the Gum Creek; it comes from the neighbouring run Kearbury, about 7 miles from my eastern boundary, and part of it runs back into the Murrumbidgee in large floods; it spreads over a good deal of country, and runs in flat channels nearly parallel to the river.
Gum Creek.
9717. You produce an estimate of the cost of irrigation? Yes; it is a copy of that which I sent to the Government when my run was divided.
Cost of irrigation.
9718. This list contains an account of 72 tanks and 15 wells, the cost of which was £29,680? Yes. (*Appendix* FF 2.)
9719. Have you adopted any means of filling the Gum Creek or any of those ana-branches? I have irrigated with a steam-engine for many years.
Steam-engine.
9720. Have you pumped water into any of those ana-branches or creeks? Oh, any steam power I could employ would be as nothing.
9721. You erected steam pumps many years ago? Yes.
Raising water.
9722. By which means you raise water for irrigation? I do.
9723. To what extent? I cannot do much. I have no great amount of steam power, nor if I had would it be of any effect—it would be merely playing at pumping.
9724. Then what course would you suggest? To let the surplus water overflow through the ana-branches.
Distribution by gravitation.
9725. That water should be sent higher up the river and distributed by gravitation? Yes. I think the Gum Creek ought to be opened to let the water flow. Back soakage would not supply such a river as the natural channel of the Murrumbidgee. The flood does overflow through the bends until the deep channel becomes almost still water. If engineers consider it practicable, I think numerous weirs should be formed in the bottom of the deep channel, not only for storage, but to carry light draught vessels over the snags.
Weirs.
9726. You think there are so many places where the water could find its way back by soakage that the people below would not suffer much? If I thought they would suffer I would not suggest it. You might lock the river, but it would be useless unless you had rocky bars. It is difficult to dam it; the whole river would be difficult to dam, and would flood most of the country on both sides, unless a get-away canal were made to send it inland.
Dams.
9727. You think that would be a good plan if engineering skill could show that it could be done? Yes; in one of my Manager's time he thought that an application would have to be sent in for the reservation of country for stock in time of flood; I could not see that, and I did not allow the matter to proceed. I have been endeavouring since to get all the water I could from everywhere. There is a plentiful supply at all points underground; it depends on how far you go.
Underground supply.
9728. Do you get good water? Good water generally.
9729. It will do for stock? Yes.
9730. Is it a general thing? It is in this country.
9731. How many years is it since you erected a pump? Mine is simply an engine watering a hay-field. I should not have had a crop for several years if I had not done that.
Irrigation.
9732. What extent is it? I have about 45 acres irrigated; the seed would not have sprung up if I had not irrigated.
Crops.
9733. Did you get any crop last year? I got two by keeping the engine going night and day during summer.
9734. Was it a good crop? It was for the soil; it does not happen to be a good spot.
9735. Do you think the cost of getting it is more than it is worth? Probably it is, but I was carrying on the experiment, looking at it in a large light.
9736. In what way do you look at it? In the way the Commission ask me to look at it.
Fodder.
9737. Have you any idea of growing any large quantity of fodder for stock in dry seasons? I have not had time to do that.
9738. Have you any idea whether it is practicable? I think it would be futile, owing to the want of labour.

Mr. T. Robertson. 31 July, 1885.

9730. The cost of raising the crop would be too much? Yes; the cost of raising, storing, and preserving would be.

9740. What is the cost of preserving? I had 150 tons of hay burnt at the very time that I wanted it.

Insurance.

9741. There is a means of insurance, is there not? It would amount to nearly the full value of the hay.

9742. Could not the difficulty be overcome by insurance? It might when operating on a small scale.

9743. You think that a man with a small holding could do it better? Yes; he is not subject to popular malice and things of that sort, and he has not to employ labour.

Artificial feeding.

9744. Have you ever made experiments in feeding stock? Not of artificial feeding; I have had too much to do otherwise.

9745. Have you any idea of the cost per head to feed stock artificially? No.

9746. Did they not feed stock last year at Groongal? Yes.

Cost.

9747. You do not know the cost? Mr. Mair gave me to understand, when we were comparing notes respecting stock which had travelled and stock which had been kept at home, that the cost of keeping them at home was about 4s.

9748. How long was that for? I could not tell. They began to feed with hay, but the rain came there much earlier than it did on my side of the river. Mr. Mair bought the hay very cheap, and he had the advantage of a railway siding on his run.

9749. It would cost him about 1s. a head per month? I think it would be more than that to me. I know that it was either three or four months that he was feeding.

9750. You say you were comparing notes with Mr. Mair as to the cost of feeding sheep at home and the cost of travelling them—what was the result? My own, I think, were a little cheaper than his, but I believe that the difference will be that my woolclip will be deficient in value.

9751. And did you lose more sheep? Yes, I lost 11 per cent.

9752. I suppose Mr. Mair lost very little? There was about the usual decrease I understood.

9753. Your books show something less per head; the difference would be made up by the loss in wool? That is a very uncertain calculation. The rains came to Mr. Mair earlier than to me.

9754. Actually there was not much difference between the cost of sending the sheep away and the cost to Mr. Mair of keeping his at home? I dare say there was not much difference.

Depth of wells.

9755. *Mr. Gipps.*] What is the average depth of the wells? Mostly under 100 feet.

Windmills.

9756. Have you tried windmills at all? I have tried them, but the only mill I had would not work when I wanted it.

9757. What was the size? Only an ordinary one at the home station. The drought put the mill out of the question.

Pump.

9758. How do you use your pump? I shift it about.

9759. Is it a centrifugal pump? Yes.

Lift.

9760. What is the height? I have lifted water at 27 feet.

9761. That is the highest? Yes, but it gives a very poor stream at that for the power used.

Discharge.

9762. Have you taken any record of the discharge of the pump at all? I cannot do that. I have a number of overground tanks, and I send out the engine and pump as much as 7 feet of water over the ground. That would flow in any direction, and I let the sheep water at it. During 1877, when I lost the great bulk of my stock, I had plenty of water that we conserved. It was want of grass that killed the sheep.

Power.

9763. What is the power of your engines? I have one 8-horse and one 6-horse power.

9764. You said you had 45 acres of ground irrigated? Yes, thereabouts, but a lot of it is bad soil.

Distribution.

9765. And do you cover it with water, or have you small trenches cut? I pour it in channels.

9766. Does the ground cake? No; the water is distributed by means of channels, and it is regulated.

9767. How long does it take you to pump enough water to cover the whole of it? I have not been so continuously at it as to be able to give a decided answer on that point. There are places where the ground seems to swallow up the water until it is full below.

9768. Does it take a week? It would take more than a week. I carry on all these experiments without reference to whether it pays or not.

Flooding.

9769. *Mr. Donkin.*] Do you try flooding the plains from the banks of the rivers for the natural grass? Yes; last year I kept the engine going night and day, but it was not good soil. There are a good many holes into which the water goes. Roly-polies spring up, and the cattle will not eat them, but they keep down the grass amongst the roly-polies.

Size of pump.

9770. What is the diameter of your pump? Only 10 inches.

9771. Do you not think it would have been more economical to have a larger pump? I dare say it would be more economical to me if the Government would turn the water over my run, but I have to do what is practicable.

Mr. Colin W. Simson, of Mungadal Station, near Hay, called in and examined:—

Mr. C. W. Simson. 31 July, 1885.

9772. *President.*] How long have you been in this district? Twenty years.

9773. Of course you know the Murrumbidgee from one end to the other? No, I do not; I have seen it in several places.

Garden irrigation.

9774. Have you attempted pumping water for either stock or irrigation purposes from the river? No; only for the garden.

9775. What is the result of it? We can grow almost anything we like if we use the water.

9776. When you pump water do you let it run on the land, or do you prepare the land to receive it? We used to have channels for the water to run along the trees. The Chinamen put on water with watering-cans for vegetables. The trees grow well and bear well, olives especially. They do remarkably well in this part of the country. I had two trees which were loaded. I believe we could grow any quantity of olives, but they must be watered.

Olives.

Preparation of land.

9777. In irrigating for grass, is it better to let the water run over the natural surface or to disturb the surface to receive the water? I have not had much experience in that. I think you would require to select flat pieces of ground or to make trenches along it.

9778. Do you think the water would cake the surface? I think it would unless the soil were suitable.

9779. Supposing on the hard red plains the land were scarified, would it not improve it very much and water it more effectually? On the flat plains we have often heavy rains. Two-thirds of my run was on

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Mr. C. W. Simson. 31 July, 1885.

one occasion under water for months, and the growth of the grass was enormous that year. The grass was as high as this table all over the plains, and it was so strong and rough that I had a very bad clip of wool afterwards. It was too strong and too coarse—the stock did not thrive on it. It was the worst year I ever had on my place.

Supply in Murrumbidgee.

9780. Have you ever known the Murrumbidgee to be dry? No. I should say it is from 2 to 3 feet deep in the shallow places, and a good stream all the summer. My predecessor told me that he once saw the Murrumbidgee so low that you could hold the water in the palms of your hands. I do not think that will occur again. I think the stock having trodden the soil so much, more water runs into the river.

Stone.

9781. What is the nature of the bed—is there any rock? No, there is no stone within 50 miles of Hay.

Dams.

9782. Do you think it objectionable to try and fill the bed of the river by means of dams? I think it would be very useful to conserve the water if it could be sent out on to the plains.

9783. And do you think it possible to dam the river? Mr. Gordon, the hydraulic engineer in Melbourne, said there was no difficulty at all about it; but it seems to me that it would be rather a difficult job.

Wells.

9784. You have wells on your run—are they deep? The deepest, I think, is 108 feet, and the shallowest about 67. It does not matter what depth you strike the water it always comes to the same distance from the surface, so that in the shallowest well there is only 7 feet of water, and in the others 48. The best water I have is 20 miles out. You can get water anywhere, but it is not always fresh. On one occasion I sank a well 67 feet deep, and we could water a lot of stock at it; it went wrong, however, on the bottom; it had a sandy bottom, and the buckets always brought up a lot of stuff. I put down another shaft 50 yards distant. The first water was rather salt; the second well went down 108 feet, and the water was nearly fresh and very good. The water came up to within 60 feet of the surface, showing, though the surface is flat, the strata below are undulating.

9785. Then the water is artesian? Yes; it comes from a higher source, no doubt; it runs from east to west.

9786. What means do you adopt to raise the water? We do it all by horse-whims—we find them the best.

Yanko cutting.

9787. You have heard of the project to run water down the Yanko Creek? Yes.

9788. Do you think it would be detrimental to residents lower down the river? It depends on the depth the cutting went.

Sluices.

9789. If they went to within 2 feet of summer level, and allowed only 1–125th part of the volume of the river to flow in regulating it by means of sluices? I think there would be no objection to taking a certain quantity to a certain height above summer level; I should say it would be a fair thing, so long as navigation is not interfered with.

Navigation.

9790. Do you think the navigation of vital importance? It is till the railway gets further; it is not with me now, but down the river they are entirely dependent upon it.*

Irrigation in Spain.

9791. Do you think the interests of the people living lower down are so great that the flood-waters of the river should not be dealt with in some way as far as possible? It seems a great waste of power no doubt to let all the water go down to the ocean, but I am not prepared to say what should be done. It is a most difficult thing to regulate the supply of water from the river and dealing with the rights of owners. I see that in Spain they have a system of irrigation managed by a Board of owners. They distribute the water, and each man pays for what he gets. When I passed through Spain years ago it was just such a season as we have had here—some parts of the country were parched; but I came across a place near Valencia where a marvellous change had been effected by means of irrigation, the country looking beautiful. We passed through miles of orangeries and orchards where abundance of fruit, including olives, were grown. There were large numbers of steamers lying in the bay ready to take the oranges away. The fruit was all raised by irrigation, and you could see the water running through channels from one patch to another.

Conservation and distribution.

9792. Do not you think the proper foundation to work upon for the distribution of water is to conserve it at the heads of the streams as much as possible and distribute it by gravitation? I think so. What I should like to see would be the water above the level of the plain. I think it would be of no use to have it below the ground. Labour here is so expensive; in Egypt they raise it all by hand labour, but here of course it would be of little use to attempt it except for small areas.

9793. Then you approve of the conservation of water higher up, and of its being brought down by gravitation along the higher ridges of the country? That is the only way it could be done to be of any great benefit. It would be expensive, but I think it would do a great deal of good to the country. I have always taken a great deal of interest in irrigation; it seems a pity to see the water being lost. I met a Captain Galton, an eminent engineer, in London, one of the Board which has been appointed to examine the Hawkesbury railway bridge plans, and he told me, when I took a map of the country to him and explained the extent of the floods, that the flood-water would require to be taken off up near the source; he said we must take off the flood-water there, or the whole thing would be knocked to pieces.

9794. Then his scheme would be to divert the flood-water at the head of the river? Yes.

Report on irrigation in Lombardy and India.

9795. I think you told me he advised you respecting some works? Yes; I cannot remember it; I think it was Captain Baird Smith's works; he was an engineer appointed by the English Government to report on irrigation in Lombardy, and he afterwards reported on that of India. There was one good part in it; the irrigation schemes and canals of India now pay 1 per cent. to the revenues of the country, after paying interest of money and all expenses. There is another thing which I observed with regard to Lombardy—that the works never paid the men who formed them—they were always ruined—but the works paid future generations. The reason given by Captain Smith for Indian financial success was progressive scientific construction.

9796. *Mr. Targett.*] The irrigation which you have carried on was for your orchard? Yes, just for the house.

Growth of fruit.

9797. Will vines grow there? Yes.

9798. Would they grow without irrigation? They will grow with irrigation, but scarcely without it; I think they would nearly die out in a dry season.

Wells.

9799. *Mr. Gipps.*] What is the average depth of the wells? I have two wells between 60 and 70 feet deep, and others over 100 feet.

Strata.

9800. What are the strata? A kind of loamy, white-looking soil.

Bottom.

9801. What is the bottom? It is the same all the way down. 9802.

* Note (*on revision*):—I have not expressed sufficiently what I wished to say regarding the Yanko cutting, and wish to add that I had no objection to surplus flood-water being taken, and thought above navigation level a fair thing. Proprietors on the river consider it only a matter of time when they will utilize the water themselves, and therefore objected to transfer their riparian rights to parties who had no claims on the water.—C.W.S.

Mr. C. W. Simson. 31 July, 1885.

9802. What is the cost of sinking? I think about £300 for a well and appliances.
9803. Do you think that this country would be available for Abyssinian tube wells? There is nothing to prevent them from boring.
9804. Are you aware that it would be far cheaper to use them? I do not know; I think nothing is so cheap as the old whim.

Abyssinian well.

9805. But in sinking with an Abyssinian tube you would have a permanent well at once? I really cannot tell; I have had no experience of that kind of machinery.
9806. *Mr. Targett.*] Of course you line your wells? Yes, they are all slabbed.
9807. *Mr. Donkin.*] What is the deepest well which you know of in the district? I do not think that there are many deeper than those which I have mentioned.

Depth of wells.

9808. Do you think that a deep well, 1,000 feet deep, would strike artesian water? I do not know.

Test bore.

9809. Do you think that it would be advisable for the Government to put down a test bore to the bed rock? I think that it would be a good thing to do; it would do no harm, and it might do a great deal of good to have the ground tested. At Mossgiel, at my brother's late station, they had gone through the rock before striking water—a kind of slaty-looking stuff.

Olive-growing.

9810. You were speaking of olives growing; do you think that it would pay to irrigate to grow fruit? It is very successful in South Australia, and I do not see what there is to prevent its being so here. In Europe there are hundreds of miles of olives; I was told that the value of the fruit of an olive tree was from a dollar to £1; I believe there was as much fruit on each of my olive trees as there was on four of those which I saw in Europe.

Mr. John Furness called in and examined:—

Mr. J. Furness. 31 July, 1885.

9811. *President.*] What is your occupation? I am always on steamers on the river.
9812. Have you been here many years? About seventeen.
9813. Are you acquainted with many rocky bars on the river? Yes.

Rocky bars in Murrumbidgee.

9814. Will you tell us where they are? There are a good many. There is a reef of rock about 40 miles below Wagga Wagga, and another at 70 miles at Goomien Station; the next is about 20 miles above Narrandera; there are no more from there to Narrandera, but from Narrandera to Balranald there are some; about 3 miles below Balranald there are some, and about 3 miles from the Murtay there is another reef in the mouth of the river; these are all the rocks that I know of.

Do. in the Murray.

9815. Are you acquainted with the Murray from Albury downwards? Not from there, but I am from Echuca to Wentworth. There is a reef of rock about 14 miles below Echuca—the Murrumbidgee Reef we call it; then there is the Waradgery Reef below Camm's Island; then there is another reef below a place called Cuttybuck, and then at the Bitch and Pups; there is no other reef then until you get down, I suppose, about 20 miles below the mouth of the Murrumbidgee; there are reefs of some sort nearly every 3 or 4 miles through to Wentworth.
9816. Have you been below Wentworth? No.
9817. Have you been up the Darling? Yes.

Do. in the Darling.

9818. Are there any reefs there? Yes, but I do not know the names of them; 80 miles up the river from Wentworth there is one at a place called Hannan's Woolshed; there is another about 20 miles higher up, and another about 40 miles below Wilcannia; there is another about 10 miles below Wilcannia, and another just below the town; there are a great many more that I cannot remember.*
9819. You have traded up and down the Murrumbidgee for many years? Yes.

Water height in Murrumbidgee.

9820. Do you recollect the lowest state to which you have seen the river? About nine years ago; that was in a dry season.
9821. How high was the river at that time at the shallowest place? I should think about 50 or 60 feet wide, and 3 or 4 feet deep from Narrandera down.
9822. You do not know of any place where it was lower or narrower than that? No.

Springs.

9823. *Mr. Gipps.*] Have you noticed any springs about the Murrumbidgee or Darling? Yes.
9824. Were they strong springs? Yes, you could see the water running out from the bank of the Murrumbidgee.
9825. Are there many of those springs? I have seen them in different places.
9826. Have you seen any of those springs on the Darling? Yes; they are similar to the others, but a little stronger; you get patches of green grass here and there where the springs are.
9827. Do the springs last through the worst seasons? Yes; in fact in the dry seasons I have taken my horses to these places to get a little green grass for them; you go right up to your knees in the soft mud.

FRIDAY, 20 *NOVEMBER*, 1885.

At Sydney.

Present:—

Mr. DONKIN, J.P.,	Mr. MURRAY,
Mr. GIPPS, C.E.,	Mr. M'MORDIE, M.I.C.E.

J. B. DONKIN, Esq., in the Chair.

Mr. Robert Barbour, M.P., called in and examined:—

Mr. R. Barbour, M.P. 20 Nov., 1885.

9828. *Chairman.*] You know the Riverina District well? I know it well, from the Billabong right down.
9829. How many years have you been resident there? About seventeen years.
9830. Principally on the Murray? Yes; from Albury to the junction of the Edward and the Wakool Rivers with the Murray.
9831. Do you know the Murray about Howlong and Corowa? Yes.

Long Hollow.

9832. Do you know whether, at any time of high flood, the water of the Murray found its way across to the Billabong at Jerilderie by what is known as the Long Hollow and Jerilderie? I do not know that district

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* Note (*on revision*):—I forgot to mention a certain place on the Darling called the Christmas Rocks, 122 miles above Menindie. These are the largest rocks between Wentworth and Wilcannia.—J.F.

district so well as further down. I think it is possible, and it has often struck me as a matter of great importance to examine the country between Albury and Corowa, in fact the whole of the Murray on our side, with the view of taking water out of the river at flood-level. Mr. R. Barbour, M.P.

9833. *Mr. Gipps.*] Only at flood season? I would only suggest it at flood season, because the river is then a great many feet higher, and available for carrying by channels into the interior between the Murray and the Murrumbidgee. 20 Nov., 1885. Diversion from Murray.

9834. *Chairman.*] The whole of that country, from Corowa to the Billabong Creek and down to its junction with the Edward River, is all level country? All dead level. Level country.

9835. Is there any ridge dividing the waters between the Billabong and the Murray? No important ridge. A race could be easily formed leading the flood-waters of the Murray to the Billabong. Ridge.

9836. You think that is possible? Quite possible.

9837. Would not that confer a great boon on the residents of that locality? A very great boon, and it would throw a permanent supply of water into the Billabong that is now almost dry. Permanent supply.

9838. In carrying out such a work, would it be necessary to place a weir across the Murray, or would you take the water only in flood-time? I would take it only in flood. The flood season in the Murray is generally from September to the latter end of December. The Murray differs from all other rivers in New South Wales in the respect that its waters are supplied by the melting of the snows in the mountains. When there is a great deal of snow there is more water in the Murray, and when there is less snow there is less water in the Murray. The months I have named are the navigable months. I have had much experience in this matter, as I had steamers trading on the Murray. It is during these months, I think, that the attention of New South Wales should be directed to taking water from the Murray, and if taken during these months no objection could be offered at all by parties living below. Weir. Source of Murray.

9839. You think that at present during these months there is a great waste of water? An enormous waste; you would be perfectly astonished at the amount. The Murray may be said to be at an average of something like 15 feet above summer level, with a width of upwards of 200 feet. That volume of water is flowing during the whole time from September to December, to waste to the sea. Waste of water

9840. After those months what is generally the normal height of the river? We call it after December not navigable, that is the summer level. Normal height of river

9841. To what point would it be not navigable; that is, how far can you navigate up the river after December? It would be dangerous to attempt to navigate after December. When it comes to summer level the boats have to be laid up. Navigation.

9842. That is not for the whole river? Yes, unless rains come to swell it.

9843. Are you speaking now of the river above Moama and Echuca? Both above and below.

9844. I think it is generally considered that the Murray is almost navigable for small steamers all the year round as far as Echuca? No, it is not navigable after Christmas, as a rule, unless a heavy fall of rain takes place to swell it. Immediately after Christmas it goes down, and then it is dangerous to attempt to run upon the river. The vessels only draw from 4 to 5 feet of water, and if you attempt to go any distance you are sure to run against a sandbank or a snag.

9845. Which Colony, as a rule, makes most use of the river for navigation? Victoria.

9846. To a larger extent than New South Wales? Very much larger.

9847. Do you think there would be any opposition if New South Wales were to block the river or take water off? I expect there would be. The Victorians are more progressive than we are. They have made a great many preparations, and are now ready to draw water off, and if they are prevented no doubt they will make objections. Objections blocking the river.

9848. They have taken a great quantity of water at Gunbower? Yes, they have been using the water for a long time.

9849. You do not look upon the Murray as of great use to this Colony for the purposes of navigation except when the snow-water is coming down? No, it is not safe to attempt to run vessels after Christmas. Navigation.

9850. The Murray is the largest stream and the most reliable of any of our rivers for navigation? Yes, and for an abundant supply of water. Supply.

9851. We have it in evidence that the flood-waters of the Murray found their way at one time to Lake Urana: do you think such a thing is possible? I think it is quite possible. In extremely high floods I have seen the Murray miles wide covering land that is not covered in ordinary seasons. It is possible that in the flood of 1870 the water may have found its way into Lake Urana. Urana Lake.

9852. You heard it mooted, I dare say, the possibility of cutting a canal from Deniliquin to Hay? Yes. Canal from Deniliquin to Hay.

9853. Do you think such a scheme is possible? I could not say. The country is very favourable for it, but everything will depend on the levels. If your starting-point, Moama, is as high as Hay there would be no difficulty. The country intervening would be very favourable to the formation of a canal—it is all dead level. If I had the railway time-table I would know the height of the railway at Albury.

9854. We have it here: it is 490 feet at Albury, and at Deniliquin 283; Moama is 315, and Hay is 304? In that case the project would be favourable. Levels.

9855. You know the Edward River well? I do. Edward River.

9856. A large volume of water passes down it? Yes.

9857. Do you think the current there is equal to the current in the Murray? I do not think it is quite so strong. It is the Murray which supplies the greater quantity of the water that goes into the Edward. Current.

9858. Entirely so, is it not? Not entirely. There is the drainage, and all those creeks which lie between the Murray and the Billabong go to supply the Edward, but the greater part of the water comes from the Murray. Supply.

9859. Do you think anything could be done with the Edward River, by locks or weirs, to hold the water back? I think it is very favourable for that purpose, without injuring any interests. Weirs.

9860. Of course now the water in the Edward finds its way into the Murray? It goes down 200 or 300 miles from where it comes out of the Murray.

9861. What is the average depth of the Edward? When it goes down to summer level there are places where you could wade across. Depth.

9862. What do you call summer level? Summer level is the level of the river between the 1st of January and the winter rains, which come usually in that quarter about May or June. Summer level.

9863. Still, it is a matter of doubt—it is an arbitrary level in the minds of different people? Yes, there is nothing

Mr. R. Barbour, M.P.

20 Nov., 1885.

nothing fixed. In a dry season you can wade accross the river; in a moist season the river rises 2, 3, or 4 feet.

9864. The Billabong joins the Edward about Moulamein? Yes.

9865. Have you seen the waters of the Edward join the Billabong? Yes.

Dams on Billabong.

9866. Is not that a rare occurrence? For some years back, owing to the construction of very large dams by the pastoral tenants in the neighbourhood of Jerilderie, the water has been stopped and does not run below that point, but formerly it used to run right through until it joined the Edward at Moulamein.

9867. If a constant supply were kept up in the Billabong it would water a large area of dry country? It would water a very large area of very dry country and very rich country.

Diversion to Billabong.

9868. Which do you think would be the more practicable scheme, to tap the Murray water to supply the Billabong, or to take the water of the Murrumbidgee down the Yanko? The best scheme is the Murray; having the largest supply, it would give the greatest volume of water.

Expense.

9869. Could it be done at no great expense? I believe it could. My idea would be to survey the Murray from Albury down to about Morrocca Station, that is where the Gulpa comes out.

Fall.

9870. You know there is a considerable fall from Albury to Jerilderie? Yes; according to the railway time-table it is about 40 or 50 feet, I think.

9871. Is it practicable to take the water across there? Yes; I would recommend such a scheme to be surveyed. I believe two or three watercourses might be cut along there—two at any rate.

Soil.

9872. You know the character of the soil of Riverina, between the Murray and the Murrumbidgee, would you say it is permeable? I believe it is good holding soil.

Soakage.

9873. You do not think much of the rainfall actually runs away by soakage? Very little indeed; it mostly goes by evaporation. My idea is that watercourses should be cut at an obtuse angle, so as to run water from the Murray into the Billabong. One might start from about Corowa.

Tuppal Creek.

9874. Tuppal Creek comes out of the Murray? Yes, on a similar angle. It is when the Murray is in flood that the creeks are filled.

Wells.

9875. Do you think much dependence is to be placed on obtaining water by wells? I do not think so. I would rather favour a surface scheme. If the flood-waters which now run to waste were conserved, enormous quantities of water might be deposited all through Riverina.

Local Trusts.

9876. Would you be in favour of allowing the erection of overshot dams to a certain height in the Billabong and other creeks, under the regulations of a local Trust, or under the authority of Government? I believe that is the proper course to be adopted. If the flood-waters were brought into the Billabong and retained by a series of overshot dams, there would be a continual supply of water.

9877. Have you had any experience of the working of local Water Trusts in Victoria? No.

9878. Would you recommend any extensive scheme of water conservation being carried out by the Government or by local bodies? I believe the Government will have to do it.

The Murray.

9879. *Mr. Murray.*] You stated that between September and December, on a portion of the Murray, the water was 15 feet deep and 200 feet wide? Yes.

Velocity.

9880. Can you tell the velocity at that point? We generally reckoned it ran about 2 miles an hour. We find an obstruction equal to that in going down stream.

9881. *Mr. M'Mordie.*] You said 15 feet above summer level—the summer level would be about 3 or 4 feet? Not on an average. There are holes where there might be 15 or 20 feet of water, but they are exceptional. There is no permanent level that you can depend on. You may get on to a part where there is only a foot of water. Below Swan Hill there are two or three sand-banks that cross the river; they consist of a kind of hard clay. Sometimes there are not more than 12 inches on the reef, then you get into a hole.

Navigation.

9882. *Mr. Murray.*] Do you not think that the navigation of the Murray is a secondary consideration to the uses that the water might be put to in the way of irrigation? Quite a secondary consideration. I believe that we have gone into an age beyond canals.

9883. *Mr. M'Mordie.*] Canals for navigation you mean? Yes; I believe they can be best utilized for irrigation and the supply of water.

Water-rate.

9884. *Mr. Murray.*] From your knowledge of that district, do you think the people would be glad to get a water supply such as we have foreshadowed, and pay a rate for the water? I believe they would be ready and willing to pay for the supply.

9885. And that under Water Trusts they would be prepared to pay a fair interest on the money laid out on extensive works to supply the water? I think they would. I would suggest simple works in the first instance; not to go into extensive works, or you might find the interest was more than people would be induced to pay. I believe it would be better to make cuttings as I have suggested than to put expensive works in the shape of weirs on the river, to secure a doubtful summer supply. It would be better to be satisfied with the excess obtained from the winter supply and from the flood season from September till Christmas, now going to waste.

Diversion of flood-waters.

9886. Do you not think such works would be also beneficial in the way of averting floods, by diverting the surplus water? Greatly beneficial in that way. By taking off the surplus water the river could be kept full, the people below would have all they could make use of at present, and the surplus would benefit other people. I lived on the bank of the Murray for several years, and I had an opportunity of observing a natural channel formed, which ran enormous quantities of water into the Edward from the Murray. There was a patch of green sward on which there were no trees, and this was used by the timber-getters in bringing logs down to the vessels in the river. When the wet weather came on the ground was soft, and the dragging of the logs made grooves in the ground. The country is so level, and the river in flood seasons is so full, that the water ran into these ruts, and in course of time they so scoured that now in a flood season there is a river running out of the Murray 200 feet wide; and in crossing it we had to be careful that we took the proper place, and there the water was just awash with the saddle. The volume of water that was thus caused to run out of the Murray swelled the Edward, and now there is double the volume of water running down the Edward in the snow season than ran down a few years ago.

Main channel.

9887. *Chairman.*] Do you think it is possible for the Edward ever to become the main channel? No; it could be made so, but it would not by Nature. The outlet from the Murray has got down now to the hard clay. There is no scour now. The channel seems to be a very firm hard clay.

9888. *Mr. Murray.*] It is only in flood-time that this outlet is open? Yes.

Mr. R. Barbour, M.P.

20 Nov., 1885.

9889. We gather from what you say that there is no definite watershed between the Edward and the Murray? The fall is all to the Edward.

9890. Almost from the very bank of the Murray? Yes.

9891. *Chairman.*] There is a fall towards the Billabong? Yes. The country is admirably adapted for conserving water and dispersing it afterwards. The Gulpa flows out of the Murray, and the opening of that creek was caused by the bogging of a bullock-dray in a manner similar to that in which the other creek was formed by the dragging of the logs of timber. The Gulpa does not run in summer, but only when the river comes to a certain height. The Gulpa.

9892. *Mr. Murray.*] Do you know anything of the quantity of water the Victorians are taking from the river? I do not know the quantity; I know they are doing so.

9893. Are they materially affecting the navigation of the river lower down? I do not think so. It is principally flood-water, I think, that they use. There are a great number of channels, and the Murray, when it is in flood, runs into these channels, and they make use of these for their irrigation schemes. You might take millions of gallons of water from the Murray during the flood season without inconveniencing anybody; that is, for several months in the year you might take a volume of water 15 feet deep and 200 feet wide. Murray floods.

9894. *Mr. Gipps.*] From what you have said I assume you would recommend that, previous to an instrumental survey of the river basins, by which alone a proper estimate of their full development can be formed, only such simple works should be constructed as would tend to allow of the diversion of the flood-waters for the benefit of the country? That is what I would suggest in the first instance. When living on the bank of the river I had ample opportunity of proving the great advantages of irrigation. I caused the gardener to cut a trench of 12 inches from the river, and when the water came to the brim it ran through the garden and then on towards the Edward. Within a few months the growth of the apple-trees was 6 feet, and the growth of the vegetation in the garden was beyond my expectation. Simple works. Irrigation.

9895. Do you know anything of the Merool Creek? Yes; that is beyond the Murrumbidgee. The Merool

9896. Do you know where it drains into? I could not say; I never followed it.

9897. Have you ever heard that the Murrumbidgee in high flood sometimes drains into the Merool? I believe it does. All that Riverina country can be very easily made to fall towards any particular point.

9898. *Chairman.*] You have been speaking of irrigation: do you know if it has been tried in Riverina for crops? Only lately. Within the last year or two, on the Murray, in my electorate, farmers have erected whims and horse-power works to pump water up to irrigate their crops, and they are so satisfied that every year they are adding to and increasing their means of irrigation. Irrigation.

9899. You think the Government should encourage irrigation schemes as far as possible? I believe so.

9900. Do you think it would be possible for farmers and graziers in Riverina, with a plentiful supply of water, to preserve sufficient fodder to take them over times of drought? Quite possible. Fodder

9901. *Mr. M'Mordie.*] And possible to sell fodder? Yes, to a large extent.

9902. At remunerative rates? At very remunerative rates. A small holder on the Murray irrigated a few acres of Indian sugar-cane, and he cut three crops in the year, yielding about 30 tons to the acre. The cattle eat the cane greedily. He is so satisfied with the result that he is going to establish a pig farm, and he expects to make a fortune out of it.

9903. *Mr. Gipps.*] Have you ever known the Murrumbidgee dry below Wagga Wagga? No. The Murrumbidgee.

9904. Is it always flowing there as a large stream? After the rainy season is over it dries up gradually until in some places it is not more than 2 feet deep.

9905. And what width? In some places from 15 to 100 feet wide. Width

9906. Would that be the lowest? There would not be a run of water of that width. The running of the stream in the summer months becomes less and less, until it is almost imperceptible.

9907. You would advise the same course with regard to the Murrumbidgee as with the Murray, that is, to avail ourselves of the flood-waters? Yes; but in the Murrumbidgee you do not get the same length of flood as in the Murray, because the floods in the Murrumbidgee are principally caused by rain, whereas the Murray flood-waters are caused by the melting of the snow in the mountains. Flood-waters.

9908. *Chairman.*] You have not seen many instances of rain-water being lost by percolation? No; the soil is very retentive. Before concluding, I might mention that a few weeks ago, at Moulamein, the water of the Edward River was backed up the Billabong 12 or 14 miles by an 8 or 10 feet rise in the Edward, giving a water frontage by the course of the Billabong of some 30 miles. From that I conclude that if an efficient and inexpensive kind of overshot dams were placed in the Billabong, at intervals of 10 or 12 miles, up to the source of supply of water from the Murray by the channel that I have said ought to be cut from the Murray, as high up that river as possible, say from near Corowa, there would be conserved a body of water—a continuous canal of water—of several hundreds of miles in length, of incalculable benefit to the Colony; and this, which would be supplied with running water from the Murray very often throughout the year, would be nearly equal to a continual running stream. Similar advantages will be obtained by the placing of overshot dams in the channel of the Edward River, although not to the same extent. Neither of these channels has ever been navigated beyond a few miles above Moulamein; that is, a small vessel has taken wool in the flood season from Wooroona Station, some 10 miles above Moulamein on the Edward River, but no higher, but no vessel has ever attempted the Billabong, so that no objections could be urged on the score of obstructing the navigation, and no expensive works need be constructed to provide for navigation. Percolation. Overshot dams in the Billabong.

MEMORANDUM

MEMORANDUM.

Evidence taken on the Lower Lachlan and Murrumbidgee.

To the Members of the Commission.

Gentlemen, Sydney, 13 August, 1885.

I have the honor to submit the following evidence, taken before Mr. Gipps and myself during our visit to the Lower Lachlan and Murrumbidgee Rivers.

I have, &c.,
WILLIAM JOHN LYNE,
President.

SATURDAY, 1 AUGUST, 1885.

Statement of Mr. J. L. Gwydir :—

President.] You are the manager of Corrong Station? Yes.
How many years have you been in the district? About sixteen years.
How long have you been managing this station? About two years.

Flooding. Will you tell us what you know in reference to the flooding of the country at the head of these works we are now on? Before we flooded the country by means of these cuttings we used to carry 4,000 sheep on the two paddocks, one of which was 5 miles by 6, and the other 6 by 8.

But before you flooded the country some of the sheep died, did they not? Yes, a great number of them.

Wool. And was the wool good on those that lived? No; the sheep were in bad condition, and there was a break in the wool.

Sheep carrying capacity. After the cuttings were made and the water was turned on to this country, how many sheep did you carry? 12,000, where we used only to carry 4,000.

Did the land carry them well? Yes; they came off in really good condition, and the wool was sound.

Flooding. How many floodings did you give the land? Two. When the cuttings were completed about twelve months ago we flooded it, and again in January or February last.

Area. What area or what proportion of land was actually covered with water? In one paddock 3 by 5 miles; in the other, 2 miles by 6.

Profit. Comparing the years when the land was not flooded with the years since, what has been the difference in actual profit? During the year before irrigation began, when the paddocks were dry, we lost from 1,500 to 2,000 sheep out of 4,000. The next year, when the paddocks were irrigated, we carried 12,000 sheep, the profit on which would be at least 3s. per head. The difference in profit in the two years was about £1,800, not reckoning the depreciation in the value of the wool of those sheep which survived in the first year, which would be at least 1s. per head. In addition, we fattened 125 head of cattle and over 200 head of horses.

Cost of cuttings. What was the cost of making the cuttings? £1,205 6s.

Mr. Gipps.] To what depth of water were the paddocks flooded? From 2 feet to 6 inches.

Duration of flooding. How long did the water last on them? The first time of flooding it lasted between four and five weeks after it ceased running, and the second time it remained longer, on account of the country being soaked. I dare say it lasted ten weeks.

Would less water have done than was actually put on? The higher the water came, the more country it irrigated.

There was no necessity to put 2 feet of water on the land? Not the second time, perhaps. The improvements were made in 1884, so that we have only had one season out of them.

Statement of Mr. G. E. Ashcroft :—

President.] What is your name? George Edwin Ashcroft.
How long have you been living in this locality? About seven years.
How long in Riverina? Twenty-eight years.
Where were you living before you came here? On the Billabong.

Area. What area of land have you here? Nearly 6,000 acres.

Irrigation. Have you attempted irrigation at all artificially? Yes; when the water breaks out, I check it and distribute it over the little creeks.

Depth of water. Have you any idea of the depth of water that runs over the land that you have flooded? From 4 inches to 2 or 3 feet.

Have you your country divided into paddocks? Yes.

Stock carrying capacity. What stock can you carry without flooding? Unless we have a great deal of rain we can carry scarcely any. The country is no good at all if not flooded. The rain does not seem to take any effect on it unless we have an extraordinary fall.

You have some paddocks you flood, and some you cannot? Yes.

What is the difference in the carrying capacity of the two? I can carry four times as many on the flooded country.

Is the country of the same nature? Yes.

Seasons. During last year was it a good season here? It was not a good season, but in spots where I had the land flooded the result was good.

Where it was not irrigated, could you carry anything? No; it was quite bare.

Irrigated area. What area have you irrigated? I must have irrigated about 2,500 acres.

What sort of feed had you over that? Really good; it was splendid where the water touched.

Stock. Did you run your own stock only? No; I took in stock also for other people. I had 1,000 sheep on the flooded country; 140 head of cattle of my own, 240 head of cattle grazing, and 450 horses grazing. This was during the summer months, from October till the middle of April.

That was on 2,500 acres? Yes.

What had you on the remaining 1,500 acres? There was nothing to eat, and the ground looked as bare as a camping-ground.

Profits. How much do you think you made off the 2,500 acres during the summer months? About £1,322 10s. Besides, I allowed about 100 head of horses belonging to neighbours to run in the paddocks free.

Duration of flooding. *Mr. Gipps.*] How long did the water last from the flooding? It came on early in September, and remained till about the latter end of December.

Height. What was its height? From about 4 inches to 3 feet. The ground kept wet from the soakage of the creeks.

Cuttings. Did you make cuttings from the Lachlan to cause this flooding? I did not make any from the Lachlan; I made them from lagoons filled by the Lachlan. A man on horseback with a shovel could make fifty or sixty openings in a day.

The ground would not have been flooded but for these cuttings? No, not at that time; and if there had been no cuttings the ground would only have been flooded to a small extent by the creeks.

You are still carrying on the work? Yes.

Fall of country. Is the fall of the country from the Lachlan or towards the Lachlan? The water almost all runs south towards the Murrumbidgee.

You have only completed about half your holding? Yes; I can extend to the other half the same benefits by means of little dams and cuttings.

System of channels. *President.*] What you have achieved is the result of a system of channels that you are cutting from the various lagoons that have been filled by the Lachlan? Yes.

You are continuing that system to bring the whole of your land under the benefits? Yes.

Statement

Statement of Mr. P. B. Moore :—

What is your name? Phillip Bennett Moore.
How long have you been here? Two years.
Where did you come from here? Yanga Station.
What is the size of your holding? My holding is 640 acres, and I have the renting besides of 1,280 acres from selectors. — Size of holding.
What is the nature of the country? Reed-bed country all of it, interspersed with gum timber. — Country.
Have you had water over it? The first year I had water over every inch of it, but last winter I had it over only about a third of the country; on my own block I had not 40 acres flooded. — Flooding.
What is the difference in the carrying capabilities of the land when flooded, and when no water has been on it? The first year I cleared over £1,000 from my own land, and the portions next; but last year, when we had only a partial flood, I did not take £500. — Carrying capacity.
How much was flooded the last year? Not a third of it. — Flooding.
How much the year before? Nearly all.
You graze stock only? Yes.
You do not cultivate anything? No; if I could afford to go to the expense of damming back the water I could grow tremendous crops on the land. — Crops.
Did you ever try to grow corn? Not on the flooded country.
Nor anything else? No.
What depth of water went over the land? On the lowest parts there was about 5 feet I suppose, and it decreased from that to nothing. The country averages about 18 inches of water over it. — Depth of water.
How long did the water remain on it? The first year, about four months.
You are just at the end of the reed-beds? Yes, about the southern end.
What becomes of the water that floods this country? It soaks quickly away underground. — Soakage.
In what direction does it go underground? I have no idea; I know we could get water anywhere in the reed-beds. In my own well here I struck the water at 15 feet. — Well.
It never goes dry? Never.
What kind of soil do you get the water in? A thick, gluey sort of sand. — Soil.
Does the water in your well rise and fall according to the flood? Yes. Last winter the level was not affected by the flood. As the reeds become dry and the water dries up, the well gradually goes back to its 15 feet level. It has never yet gone below that level. The year before last the water in the well was up to the top of it, and it gradually went away as the summer advanced. — Rise.
Mr. Gipps.] Do you use the windmill? Yes. — Windmill.
What kind of windmill? Althouse.
What is the diameter of the vane? 10 feet; but I would not recommend any one to purchase any smaller than 14 feet.
You find it answer very well? Yes.
What quantity of water can you pump with it? You cannot use more than an inch and a quarter pump.
Do you ever exhaust your well with it? Never; it does not seem to affect it.
What is the diameter of the sail? 4 feet by not quite 2 feet.
And the diameter of the pipe? An inch and a quarter.
Suction-pipe? Yes.
What quantity of water can you get by continual pumping? I do not know. I dare say I could get, by a good steady breeze all day, 5,000 or 6,000 gallons of water.
How many days in the week, in a hot season, does the wind blow sufficiently to use the pump? In the summer every second day. — Wind
Do you get a good breeze in the summer-time? Yes, plenty of wind to work the mill.
What is the prevailing wind in summer-time? North-north-east, or northerly.

Statement of Mr. James Tyson, junior :—

President.] What is your name in full? James Tyson, junior.
You reside at Tupra Station? Yes.
How many years have you resided here? On this and the adjoining station thirty-seven years.
You have known all the floods in the Lachlan during that time? Yes; except during eight years of the early part of my residence; during the last twenty-nine years I have known all the floods. — Lachlan floods.
Can you recollect about the time of the heaviest floods during that time? In 1852 and 1870.
Was there not a heavy flood in 1864? There may have been, but it was not so heavy as the others.
About what period elapsed between the floods? Sometimes we have floods every three or four years running in succession. — Periods.
And is there a series of years without floods? Up to the present we have never known more than two years without a good flood, but this time we have gone three years without; this is the longest period I know for twenty-nine years.
During the heavy floods you speak of, you knew creeks and depressions back from the river a considerable distance that were filled with water from the floods? Yes; on the north bank of the Lachlan, wherever you see box timber, you know flood-water has run there. — Places filled by floods.
The floods that occurred between 1852 and 1870 did not fill those places? They did not fill the outside places; in about 1875 most of these outside depressions were filled to a distance of 60 miles below Booligal, as also in 1864.
When did you commence any cuttings to lead water into the back country? In 1861. — Cuttings.
What cutting was that? From Lignum Lake to Boocathan Lake, a distance of about 4½ miles. — From Lignum Lake to Boocathan Lake.
When was the lake filled after that? I think within twelve months after the cutting was completed, as near as I can remember; Lignum Lake is filled by several creeks running from the reed-beds; Boocathan Lake is filled by a cutting made in 1861.
From the Lignum Lake? Yes.
What depth of water was in that lake? About 52 feet. — Depth.
It has never been dry since? No; it still has 4 feet of water in it. — Supply.
How long is it since any water ran into it? No water has run into it for two years, but for three or four years previous to that the cutting had so silted up that very little water used to come into the lake, and that is the reason why the supply is so small. Last year I cleaned out the cutting and made it wider than ever it was before, so a fresh coming down every three or four years will be almost certain to give sufficient water. Between 1861 and 1884 not more than £30 per mile had been expended in keeping the cutting in repair. — Cost of repairs.
What was the cost of that cutting? As nearly as I can remember, about £640 per mile; I may add that a small cutting had been previously made by the former lessee of Juanbung Run into Bunoombert Lake, where Juanbung head-station is now, but it was a failure; previous to 1861, and up to 1882, little or nothing was done to keep it clear; this was a small cutting 12 feet on top, with slopes, and it silted up. I then in 1883 made a cutting three times the size, that will stand good for twenty years. — Cost of cutting. Cutting to Bunoombert Lake.
Has that lake ever been dry since? Yes; because the cutting was not made large enough in the first instance, it was dry in 1883, but it held water for twenty years. — Supply.
And now the cutting is widened again? Yes; in the latter end of 1883 I deepened it, and now the quantity of water that goes into the lake is such that it will never be dry again.
When was the third cutting made? In 1864; that was leading from the Lachlan River, about three-quarters of a mile above Oxley township, to a lake called Cummachum; thence in a northerly direction 5½ miles into Box Creek. — From Lachlan to Cummachum Lake.
What was the effect of that cutting? A large supply of water ran through within about twelve months after the cutting was completed.
Has that lake ever been dry since? Not quite dry. — Supply.
What was the cost of the work? I have not made an estimate of the cost, but I have heard it was £14,000. — Cost.
What was the depth of the cutting? From 7 to 13 feet. — Depth.
What was the width? At the bottom, 12 to 14 feet, with a slope of 3 to 1. — Width.
What was the fall? A foot in the mile. — And Fall.

And there was the same fall to the other lake? Not less than a foot in the mile—in every cutting we allowed that fall; if the country gave more than that we had not to allow it in the work.

Cutting towards Mount Emu. What was the next work? The next work was a cutting commencing about 10 miles west of Bunoombert Lake, at the head-station of Juanbung, from a box swamp supplied by Lachlan water at the time of high flood, and running into a lake near Mount Emu. That cutting was about three-quarters of a mile long, about 3 feet deep, and about 14 feet wide. It was made in 1870.

The water did not go further than Mount Emu Lake? No; there was a regular basin there.

Depth. What was the depth of water? About 10 or 11 feet. There was a natural depression, and we thought to save a lot of water. In 1869 we made a cutting from Duckshot Lake into a lignum swamp east of that lake.

Duckshot Lake. Where did you take the water to in that cutting? From the swamp into Duckshot Lake, a distance of about 2½ or 3 miles. The cutting was about 14 feet wide at bottom, and about 2 or 3 feet deep. The water we got through into Duckshot Lake at that time came through Dry Lake on Walgiers run, and from the Lachlan River about 7 miles above Booligal, by the Merrimidgel Creek. The overflow above Walgiers Lake, which is the first to run, also joined these waters.

Cutting. How long did it take to come down that course? The cutting was made in 1869, and in the high flood of 1870 the water came down and filled the lake within two months. It took two months, because the cutting was so small.

Supply. What quantity of water was held in that lake? It is about three-quarters of a mile in diameter, and 32 feet deep in the centre, giving about half a mile flat bottom in the centre.

Dams. What was the next cutting? The next permanent work we did was a dam about 2½ miles from the Murrumbidgee River to a plain situate north of the bank of the river called Cockatoo Plain. The object of the dam is to force the water north and west to irrigate country. We have not received any benefit from that yet, as the floods have not been high since the dam was made.

In connection with that work, you have also dammed some creeks that allowed the water to run into the Murrumbidgee River? Yes; from that, which is about 6 miles to the junction of the Lachlan, I have a string of dams to keep all water from again going into the Murrumbidgee River. I have also a dam 3 miles long 2 miles south of the Lachlan reed-beds, crossing a number of creeks, to convey the water westerly to Cockatoo; it cost £600.

Cost. How much did that cost? Over £800, without the little dams; about £1,300 altogether.

Effect. What will be the effect of that? The effect will be to cause an ordinary flood or fresh to irrigate or flood something like 50,000 acres of land, besides forcing the water to a level in a north-westerly direction, so that we can again fill the lake at Mount Emu, which is about 12 miles north of the bank of the Murrumbidgee.

Cutting from Bullogal Lake to Ryan's Lake. What was the next work? In 1884 and part of 1885 we made a cutting from Bullogal Lake to Ryan's Lake, thence to Duckshot, about 10 miles. We also put a line of dams from Bullogal Lake to the Lachlan River, a distance of about 14 miles. We then made nine cuttings from the Lachlan River for 1 mile above that. These cuttings help the natural overflow 1½ mile above Reserve No. 106, Walgiers Run.

Size. What size are they? 2 feet deep, and from 20 to 30 feet wide.

Dam. Did you throw a dam across the Lachlan River below those cuttings? There was a dam previously, and we took advantage of it. There was a dam below the cuttings which raises the water whenever a fresh comes down, so that it will flow through the cuttings and get out on the north side of my line of dams.* If sufficient water is brought down in that way,

Box Creek. by putting a dam 5 miles below Duckshot on the same watercourse, the water can then be turned into Box Creek, which goes into the Murray somewhere near Euston. This watercourse was 300 yards wide at its narrowest crossing on Tupra Run in 1870, with running water 1 foot broad, 3½ feet deep. I put a bridge over at this place, and crossed 200,000 sheep. That

Bridge and channels. year this bridge was inspected by Mr. Road Inspector Philben. The effect of this work is, by a complete system of channels, and by damming up creeks that allowed the water to run back to the river after it broke out, to make a direct course for the water to Duckshot Lake, and prevent it from running back into low lignum flats that lie below my land, and absorb an immense quantity of water.

Filling of Duckshot Lake. By these means that you have adopted you are enabled to fill Duckshot Lake, I suppose, at any ordinary flood? Yes. Before that time, when the water came from Bullogal, and down from the Merrimidgel, there was no certainty of water in Duckshot once in ten years; now there will be a certainty once in three years, providing these works are protected.

Irrigation. Not only that, but there will be a certainty every year that from 20,000 to 30,000 acres will be irrigated on the upper part of these waterworks.

Cost. About what is the cost of this work from the outlet of the Lachlan to Duckshot Lake? For the full distance of 26 miles it is about £5,000. Of this length, only about 10 miles have been cut, as in some places the natural creeks have been utilized. The cost of the works at the outlet, extending over the first mile, is £460. The dams from thence to Bullogal Lake, £100 per mile, only damming main creeks.

You say there is a dam below the cuttings? Yes.

Dam. Does that dam keep permanent water above it? Yes.

By-wash. And at what height does the by-wash take the water off? At about 5 feet from the top of the bank. When the by-wash is running there are 3 feet of water in my cutting, and a depth of 5 feet running round into the river.

Size of cutting. What size is the cutting? 18 feet wide in the bottom, with a batter of 3 to 1.

Execution. You do it by ploughs and scoops? Yes. The deepest part is about 5 feet 4 inches, with a fall of a foot in the mile, and

Fall. any fall in the country added to that. In a part of the same work there is a fall of 5 feet in the mile.

Dams on Lachlan. Have you found any difficulty with the dams that are put across the Lachlan? Very little. The dams are provided with by-washes which come gradually in, and stand generally about five or seven years without much repairing. Sometimes we shut them up and make a fresh by-wash, but in no instance for twenty years have we had to abandon an old dam because there was too much by-wash.

Do you think that by a system of dams right down the river a large amount of water would be kept back in flood-time? Yes, it is quite practicable, because from Oxley to Booligal, a distance of 60 miles in a straight line, there are dams from every 4 to 7 miles. The first was erected in 1860, and the water throws from one dam to another.

Have you had any experience in connection with the Murrumbidgee? None, except in making cuttings out from the river to flood low-lying lands.

Dams on Murrumbidgee. Do you think it would be practicable to put dams across the Murrumbidgee? Quite so.

Bars There are plenty of bars across it? Plenty.

By that means the bed of the river would be constantly filled with water? Yes.

Carrying capacity. What increase do you estimate these works will make in the carrying capacity of your stations here? I think about 100,000 sheep.

Proportionately, I mean? Well, the country now carries threefold what it used to carry. When the whole work comes into operation, I estimate the carrying capacity will be increased at the rate of five to one.

Mr. Gipps.] From what distance below Booligal or Forbes have you had experience of the Lachlan River? From about 7 miles above Hillston to the junction I have a knowledge of the river on both sides.

Dams. How many dams are there in that distance? Ten.

Character. What is the character of the dams? Just mud dams across the river, 14 feet wide on top, with a slope of 3 in 1 on each side.

Height What is the average height? About 18 feet, I should think.

Are the dams higher on the upper part of the river, or *vice versa*? I think on the lower part the dams are slightly higher; there is a greater force of water down here.

By-washes What provision is made for by-washes? The dam is always put in the river at a place where there is at least a quarter of a mile of low land, which allows a natural flow of water from the river.

Water courses. Are there any natural watercourses by which the river is diverted? Plenty.

The Willandra What benefit are they to the country generally—do they extend any distance? The Willandra leaves the Lachlan River about 30 miles above Hillston, and flows in time of high flood almost to the Tallywalka, which leaves the Darling at Wilcannia. It runs in a north-westerly direction for 170 miles, I should say.

Channel In what kind of channel? A deep channel for the first part of the way—for 100 miles—then through box flats, and then the channel becomes broader.

Diversion Box Lake. Could the water be diverted into natural depressions or lakes? It does fill several box lakes on the way; it then spreads into Box Lake.

Size. What size is it? About half a mile in diameter, and it holds from 4 to 5 feet of water.

Do you know of any depressions which could be filled by it? Not any large ones. What

* Note *(on revision)*:—The 6 feet rise at Forbes, at present in the Lachlan, is flooding this country.—J.T., 12/8/85.

What is the next watercourse below that? The Merowie or Box Creek, which leaves the Lachlan 7 miles above Hillston. Merowie or Box Creek.
It runs north-west in the first instance, then west, then a little south and west until it enters the Murray near Euston, keeping out from the Murrumbidgee at a distance of about 40 miles.
What is the character of that channel? It is a deep channel for about 100 miles, and then it seems to have been silted up, and spreads a good deal into box lakes as the Willandra does. The channel, carried right through into the Murray, is a well defined channel. Channel.
Would that be available for any other depression? A great deal of good could be done by damming and spreading the water. There are depressions on the side all along that could be filled by cuttings, and they would hold about 10 feet of water. Depressions.
What is the next natural watercourse? The next one below the Merowie or Box Creek is the Merrimidgel, which leaves the Lachlan about 2 miles above Booligal. That also runs in a north-westerly direction, keeping about 10 miles south of the Box Creek. It goes on through a lot of lignum flats for a distance of 30 miles, to fill the Dry Lake and also Duckshot Lake. Part of the water then goes north into the Box Creek, and part of it south into the Lachlan River at Oxley. The water is divided at the Dry Lake. Merrimidgel Creek.
What is the character of that channel? A lignum flat, from ¼ mile to 2 miles wide all the way. The channel itself in the centre is about 4 feet deep, and about 30 yards wide. Channel.
Could that be used for any other lakes? The only advantage that could be derived from it would be to check it from flowing back into the Lachlan, and to turn it north to the Box Creek.
Are there any other natural watercourses? The Mucklebar, which leaves the Lachlan a little below Booligal, and comes on towards Walgiers Lake, which it fills in passing. It then takes a north-west direction, and joins the water that runs into the Dry Lake and Box Creek. The Mucklebar.
Could that be used for any other purposes? For nothing better than diverting the channel into the Box Creek. There are no natural lakes along that watercourse, and it is well defined until it comes to Walgier's Lake, being about 5 feet deep and 30 yards wide. When it reaches Walgiers Lake it is about 200 yards wide, and 2 feet deep, and covered with lignum.
This creek does not run unless we have a fairly good flood, say 12 feet at Forbes.
Could greater use be made of the water by diverting it or preventing it from entering Walgiers Lake? Yes; if it enters Walgiers it falls south into the Lachlan, or into useless lignum flats, and is lost. By keeping it out, great benefit is derived from it.
Is that one of your improvements? No; the water from my improvements joins that, in a 12-feet rise from Forbes.
What is the depth of the channel with regard to the bank of the Lachlan River, where it leaves the river? It leaves in a general flat, and forms into a creek when it gets away from the river. Channel
The next creek that leaves the Lachlan River of any benefit to the country is 1½ mile above reserve No. 106, and then runs in a direct line 1 mile wide to the north shore of Walgiers Lake; creeks abound all the way on the south, and when it reaches there it is called Peppermint Creek, because it runs past Walgiers Lake and fills another lake called Peppermint Lake. Peppermint Creek.
That does not fill Walgiers Lake? It fills it in passing. Mucklebar and Peppermint both meet, and a certain quantity of the water runs into Walgiers Lake, and the rest of the water flows west.
What becomes of the stream of those creeks? Before I made the improvements the water used to run south from the creeks into low, dead lignum flats, that held water from 3 to 4 feet deep, and as the river lowered the water gradually drained back into the river, leaving the country completely scalded through the water lying so long on it. But by means of a dam at every quarter of a mile, shutting off the creeks flowing south, the water is conveyed in a more direct course, and spreading northerly it irrigates country from half a mile to 2 miles wide in the whole distance. Walgiers Lake.
What is the area of Walgiers Lake? About 1,000 acres. Depth.
And the depth of it? When full, it will hold about 7 feet of water.
It would be merely an evaporating pan? It is not an evaporating pan; there are outlets on the south side which it fills and empties again.
There would be no advantage in filling the lake? No; we have dammed it to keep it dry, because it grows good herbage. Cummachum Lake.
How many stock do you water at Cummachum Lake? About 20,000 sheep every summer. Depth.
What is the average depth now? 5 or 6 feet.
The average depth full is 10 feet? Yes; from the time it was made till now we have watered 20,000 sheep all over every year through the summer months.
With regard to your experience of the Lachlan River, the general trend of the country is from the Lachlan towards the Darling? Yes. Trend.
And from the Murrumbidgee towards the Lachlan? No; from the Murrumbidgee towards the Edward. The Murrumbidgee waters drain south. The Mirool is the only water from the Murrumbidgee to the Lachlan. Between here (Tupra) and Coldwater, there is water which runs from the Lachlan to the Murrumbidgee. It comes in 5 miles below Maude. The tendency from the Lachlan 15 miles below Booligal is towards the Murrumbidgee. Above Hay, the Murrumbidgee water comes to the Lachlan; below Hay, it goes to the Edward. The Mirool.
Have you had any experience in wells? A good deal. We sank trial shafts through the salt-bush country, but we found salt water in every shaft. We tried in watercourses, in sand-hills, or plains, in fact in every character of country for about 40 miles north of the Lachlan River, and then beyond that we found fresh water. Wells.
At the same depth? Yes. Fresh water supply.
What was the average depth at which you got fresh water? From 140 to 170 feet.
Do floods in the river appear to influence the water? Not at all—the floods have no effect on it. These wells will water from 10,000 to 40,000 sheep each. Level.
Do they show any difference in the level? Not from year to year; we have had them for fourteen years.
It seems a permanent level? Yes.
Is there any apparent current in the well? I have not had that experience. Windmills.
Could windmills be availed of? We have not sufficient wind here—it is not regular enough.
President.] Did you ever know the waters of the Lachlan and the Darling to meet? I did not know them to meet right through, but I know the Lachlan and the Darling went within about 10 or 15 miles of each other, 90 miles south of Wilcannia, and there was nothing to hinder the one from joining the other. Darling and Lachlan waters joining.
What do you think is the evaporation from these large sheets of water in the shape of lakes that you have made? From 18 inches to 2 feet per year, with stock-drinking and evaporation. Evaporation.
The channel of the Lachlan is lost in the reed-beds 7 miles north of its junction with the Murrumbidgee. It then spreads over flat country, having watercourses running north, north-west, south, south-west, and south-east. The watercourses running north extend about 12 miles into the Box Creek, filling Bunoombert Lake, 28 feet deep, in passing; the water extends by channels west to Mount Emu, where it fills a lake about 10 feet deep; it then extends south to Tori Lake, which is situate 14 miles below the junction of the Lachlan and 5 miles north of the Murrumbidgee. In time of high flood Murrumbidgee waters join here; the waters then run west and north-west by several channels, a distance of 30 miles, to the Box Creek, filling several extensive lakes; the flood-waters have a spread of 10 miles wide in some places. The Lachlan water running south-east from the reed-beds flows into the Murrumbidgee, 7 miles above the junction of the Lachlan River. It also flows into the Murrumbidgee by numerous channels for 14 miles below the junction; by this it is seen that the junction of the Lachlan is 28 miles wide. Channels. Junction of Lachlan.
Within 1 mile of reed-beds all around, fresh water was obtained at 20 to 30 feet deep, which rises and falls with the flood-waters. All wells sunk north and west any distance within 40 miles of the reed-beds, having a depth of 150 feet, contain a large supply of salt water; we then meet sand-hills having a fall towards the Darling River; fresh water from this to the Darling in wells 150 feet deep. Fresh water.
There is a watercourse that leaves the Lachlan on the south side 30 miles below Booligal, runs into the Murrumbidgee 5 miles below Maude, filling three or four small lakes in its course. This watercourse at its narrowest part in time of flood is 200 yards wide and 3 feet deep. I may mention this is the only water from the Lachlan to the Murrumbidgee between the junction and Forbes. Water course.
With respect to the cuttings made on Juanbung and Tupra Runs, several of them have been completed twenty-one years; the deepest cutting has a fence either side. The silting up of this cutting is only effected by rainfall, causing a few gutters inside of bank, the deposit making bars of a few cartloads of stuff; this we clean out with long-handled shovels once a year. The shallow cuttings of 4 or 5 feet deep are not fenced, and stock are allowed to water all along, and cross backwards and forwards, thereby causing a silting up from traffic; this I remedy by taking out one ploughing every three years. My estimate for keeping all these cuttings in repair is £10 per annum per mile; none of these cuttings are damaged in the least by the passage of water. Cuttings. Silting. Stock watering. Cleaning.
Walgiers Lake, situate 20 miles below Booligal, to 20 miles above Hillston on the north bank of the Lachlan River, five main watercourses leave the Lachlan River, running in a north-westerly direction, spread and continue to Mally, 90 miles distant east of the Darling River; the higher branch (Willandra) goes through a flat country, and joins the Tallywalka about 90 miles below Wilcannia and 30 miles east of the Darling River, both waters meeting and spreading into box lakes; Watercourses.

all the other waters tend towards the Box Creek, and keep 20 to 40 miles out from the Lachlan and Murrumbidgee Rivers, and enter the Murray about Euston, there being a general network of creeks filling box swamps in passing. All the lakes on both sides of the Murrumbidgee and Lachlan Rivers are of an oblong shape, extending north to south, with high banks on the east and low banks on the west; the inlets are north or south, outlets north, south, or west. There is only one outlet on the north bank of the Murrumbidgee that carries the water to the Lachlan; that is about 20 or 30 miles

The Mirool. below Narrandera, a flat flooded country extending to the Mirool; the Mirool joins the Lachlan water that leaves the river 25 miles below Hillston, running through Gunbar Run, filling numerous box lakes, keeping out about 25 miles from the river, goes into the Lachlan 15 miles below Booligal; I have seen this creek run frequently. On the south bank of the

Watercourses. Murrumbidgee there are numerous watercourses, extending from 15 miles below Hay to Balranald, running across to the Edward 10 miles below Moulamein; the principal of these watercourses run on to Tooginbie and Nap Nap Runs; there is a watercourse leaving the Billybong 10 miles below Wanganella that runs into a lake 2 miles in diameter, holding 8 feet of water, situated 25 miles north of Moulamein; the water then runs south and west, joining the Murrumbidgee waters, and emptying into the Edward 10 miles below Moulamein. Below Deniliquin, on the Edward, 5 miles on the north and 10 miles on the south, there is a continuation of outlets running north-west and south-west, joining the Billabong and Murray waters within about 50 miles below Deniliquin, the flow on the north being very light, while on the south very

Outlets. heavy, many creeks being swimmable for a horse. The principal outlet of the Murray on the north is the Edward above Moama: then again 20 miles below Moama to the Loddon Junction, there is a network of flooded country with deep creeks extending from the Murray to Moulamein. By drawing a line from the junction of the Lachlan to 10 miles below Moulamein, and a line from Moulamein to the junction of the Loddon, you pass through flooded country the whole way. The waters of

Flood-waters. the four rivers, Murray, Murrumbidgee, Edward, and Lachlan, in time of high flood, meet in the Wakool, 20 miles below Moulamein, with a system of dams and weirs. All the surplus water in these four rivers can be utilized for irrigation, owing to the vast area the water can be made to spread over, the general character of the country being flat, having

Bed of Murrumbidgee. natural waterfalls. I have seen the bed of the Murrumbidgee dry in places from 200 yards to a mile of a stretch, about 1855 or 1856, from 80 miles above Hay to the junction of the Lachlan. I was four weeks travelling that distance, camping

Bars. and spelling a mob of horses, crossing the river backwards and forwards every day. There are sandstone bars in the bed of the river, I should say from 3 to 10 miles apart that distance; when dry they will carry a dray over like a metal road. I believe the sandstone in this river is identical with that in the bed of Bungary Lake, Tupra Run; this I quarried for 2 feet, but did not bottom. Between Echuca and Swan Hill, on the south side, the watercourses leading from the Murray do not go out a greater distance than 15 miles, then return to the river. Two rivers, Campaspe and Loddon,

Fall of country. enter the Murray between these places; the general fall of the country on the south side of the Murray is north. The character of the Lachlan and Murray Rivers is similar, the fall from both rivers being north-west—watercourses extending for hundreds of miles, while on the south of both rivers the water does not extend back more than 15 miles; add to this, several rivers feed the Murray on the south, while there are some running into it on the north. I look upon

The Murrumbidgee. the Murrumbidgee as being on a high table-land between the two rivers, having a fall both ways. The flats on either side

Irrigation. of the Murrumbidgee, say 592,000 acres, can be irrigated at a cost of £59,200 without any weirs between Balranald and Hay, by taking half the surplus water that flows to waste every year, still leaving the river navigable in all floods.

Statement of Mr. J. E. Pearce:—

As those gentlemen who have given evidence before you simply give their opinions, and having had fifteen years' experience in this district, I make bold to submit my thoughts on the subject of conserving water for the purposes of

Irrigation by steam power. irrigation. Allow me then to state, from inquiries I have made of persons who have raised water by steam-power, they have invariably told me the profit did not pay the cost. This was especially the case with Mr. Wm. M'Gaw, of Kooba Station, who tried the experiment under most favourable circumstances, having a high point of red loamy ground, on which his engine was placed, giving a slight decline for the water to flow for half a mile at least on either side. Major channels were made first by plough and shovel, then minor plough furrows carried the water over a surface of 400 to 500 acres; he had a stationary engine of about 18-horse power, and the height of lift would be from 20 to 24 feet, while everything was done as economically as possible, yet, whether the gain was equal to the cost did not concern him, his object being more to make certain a crop of hay, and to afford a certain amount of pasture for stud sheep and cows, but he assured me he did it all at a great loss. I do not say that this applies to water raised for garden cultivation on small areas and chosen spots, where, by windmills and horse-power combined, vegetables and fruit are produced. I have therefore come to the conclusion that to irrigate on a large scale so as to make the produce pay for the cost can only be accomplished by natural gravitation, and wherever mountain streams can be diverted in prepared channels and sent at various points over the land, the highest results must follow. Judging from the quantity of water that yearly runs to waste, both in the Murray and Murrumbidgee, I imagine an

Irrigation by gravitation. abundant supply could be obtained to irrigate by gravitation, and yet to leave a constantly running stream in both rivers; but the embankments required for the reservoirs would be immensely costly, and should they break away would sweep away a town situated as Wagga is on the Murrumbidgee; there is therefore great danger attending the construction of large

Reservoirs. reservoirs in deep valleys situated above towns on the same watercourse. But, supposing the danger could be overcome, in times of great floods the whole volume of water must be allowed to escape until sufficient only remained to fill the

Distribution. reservoirs to the requisite holding capacity. Again, supposing the reservoirs made with gates to allow flood-waters in their first rush to pass, the water from these reservoirs must be conveyed in surface canals for redistribution on the lower lands, and these canals would have to be flumed over creeks, billabongs, and low places, the cost of which would be very great, and yet I do not see how otherwise you can water these plains by gravitation. I am aware, when once done, the irrigated

Enhanced value. land would be enhanced twentyfold in value, but the area would be comparatively small to bear the expense, owing to the flat character of the country and its absorbing nature. To determine this question would require the most accurate survey and the highest scientific skill, and unless the land on either side of the canal were resumed would only add to the wealth of present proprietors. I should be sorry to discourage a project of this kind if the difficulties attending it could be surmounted, but we are bound to look them fairly in the face, and they are of no ordinary kind. The conclusion I come to is that irrigation to be generally profitable must be by natural gravitation, and the circumstances I fear will have to be more favourable than are found to exist on the Murrumbidgee. I have no doubt as to the practicability of damming

Locking of Murrumbidgee. or locking the Murrumbidgee, since its bed is mostly a very stiff tenacious clay, but the effects of damming in heavy floods would so impede the natural course of the water as to cut new channels, and other disastrous effects might follow. I think locking a much preferable plan, as it would throw the water out in various billabongs where needed, and offer less

The Murray. obstruction in times of flood, as well as keep the waters at a better height for those who desired to irrigate artificially. I believe my conclusions, as regards the waters of the Murrumbidgee, will apply to those of the Murray, only in that case Victoria would have to be a consenting party, and one-half of the water flow would be claimed by her. I wish

The Lachlan. further to state that scarcity of timber for fuel will always operate most seriously against the use of steam for lifting water for irrigation throughout the whole of this district. The case of the Lachlan River is very different to that of the Murrumbidgee or the Murray. The catchment of the Lachlan is not so large as either of the other rivers; and while in the Upper Lachlan the bed is a deep wide ravine, capable of conveying a great volume of water, as it gets into the low flat level country there are numerous creeks and billabongs that divert the streams, which are nearly if not quite as large as the river becomes after they branch away from it. I refer first to the Willandra Creek, which, when in full flood, is nearly if not quite equal to the Lachlan. After it leaves that creek, then the Merrowie Creek takes off a third more, and then the Tooroogannie Creek takes another share of the Lachlan waters, besides numerous billabongs which break out of the Lachlan and flow on, some for hundreds of miles—in fact, there is no water to spare out of the Lachlan when all these creeks and ana-branches are supplied, and the chief thing needed is that these creeks as well as the Lachlan should all be

Dams. dammed continuously with low constructed dams throughout their whole course. This can be easily done if the dams are made in the creeks or rivers at the mouths of the billabongs just high enough to divert the water into the billabongs, which will then flow round to the back of the dam, and not wash it away when the water rises over it. There ought to

Trusts. be a local Trust appointed to regulate the place where, and the height, these dams should be constructed; of course they

Wells. might be overlooked and carried out under the inspection of a practical engineer. Respecting wells, there are large tracts of country where fresh or good stock water can be obtained at from 80 to 100 feet; this is chiefly so on the south side of the Murrumbidgee, but to the north, as you go towards Mossgiel, Clare, and numerous other stations, it is very difficult to strike upon good stock water, and in such country an artesian bore might be of great value.

Reservoirs. P.S.—In reference to the Lachlan River, I ought to have observed that the construction of reservoirs anywhere on its branches at its head, to store water to keep up the gradual waste by evaporation and absorption on the lower part of the river, its creeks and billabongs, would be of immense advantage.

APPENDICES TO THE EVIDENCE

TAKEN BEFORE THE

COMMISSIONERS.

For Maps, Plans, and Diagrams referred to in the Evidence as Appendices, see the accompanying Portfolio.

ROYAL COMMISSION ON CONSERVATION OF WATER, &c.

APPENDICES.

[*Documents forwarded by Mr. David Greig, and ordered by the Commission to be printed*, 21 *August*, 1884.]

Mr. Goyder to Mr. D. Greig.

South Australia, Surveyor General's Office, Adelaide, 11 August, 1884.

CERTIFIED that the agricultural machinery and implements, comprising traction and drawing engines, fuel and water-tank-engines, steam-scoops, cultivators, ditchers and drainers, to the value of over £22,000, ordered by me for the Government of South Australia, of Messrs. Fowler & Co., of Leeds, were constructed and completed in the most careful manner, and manufactured of the very best material.

Since their arrival in this province they have been worked to my entire satisfaction, and I have much pleasure in giving this certificate.

G. W. GOYDER,
Surveyor-General.

ABSTRACT of what has been done by the Steam Scoops imported by me for the Paratoo Station—one set in 1877 and one set in 1881.

	£	s.	d.
Two sets engines and scoops, including duty, preliminary expenses, two scoops put aside, railway charges, cartage, &c., and wear and tear on bullock drays, &c., in attendance...	7,907	15	3
Amount paid for wages and management	5,233	16	8
Cost of rations	1,159	2	1
	£14,300	14	0
Less present value of imported plant—say	6,000	0	0
	£8,300	14	0

Something like twelve months was taken in the first instance before we got the tackle fairly to work.

Work completed to 31 Dec., 1883,—289,349 cubic yards, for which I estimate the value to the station ... £14,974 5 4

Of this 147,726 yards were taken out below the depth of 10 to 26 ft., or say a cost of 6¾d. per yard.

The saving in cost by no means represents all the benefit my runs have derived from the scoops. The greater depth, unattainable by bullocks, has enabled me in dry seasons to keep sheep in paddocks from which they must have been moved months before rain came, had I only had bullock scoops.

Adelaide, 11 August, 1884.

THOS. ELDER.

Mr. P. Waite to Mr. Greig.

Dear Greig, Adelaide, 11 August, 1884.

I have much pleasure in giving you an abstract of what the steam scoops have done for us, and at the same time to thank you for the great trouble you have taken in bringing them to their present state of perfection. I have no hesitation in stating that without them much of the country we are now successfully occupying could not have been occupied at all.

We have sunk wells without result until we are fairly sickened of well-sinking, and we are now making the country permanent by tanks of 18 feet to 26 feet, of the following dimensions: 80 yards × 60 yards, 80 yards × 70 yards, and 80 yards × 80 yards; the latter two are what we usually make them, and you must bear this in mind when you compare costs. You will find as a rule the widest tanks made by private individuals do not exceed 50 yards; and as the cost of excavating is materially increased by the distance the dirt has to be carried, you must allow a fair margin in comparing the cost of excavating the 50 yards and the 80 yards wide. You will also have to take into consideration that the bulk of the work done by the steam scoops was from 10 feet to 26 feet, and not from 1 to 26 feet.

We keep a large force of bullocks with the ordinary bullock scoops taking the top off, not because they can do it cheaper, but by carrying on in this way, we get so many more deep tanks made in a year than if we kept the engines completing the job from the beginning. I fully expected having six scoops at work, and would have had them had we not had the energy knocked out of us by bad legislation.

The machine itself is as nearly perfect as possible,—all that is wanted is a man with a little common sense to manage; not an engineer, but a good sensible blacksmith like what we have. There is nothing about the whole affair but what a man of ordinary ability can grasp in a day or two.

Yours very truly,
PETER WAITE.

Mr. H. B. Hughes to Messrs. John Fowler & Co.

Adelaide, 11 August, 1884.

I RECEIVED your letter of 4 July, and have had the pleasure of meeting your senior practical partner, Mr. David Greig; and in reply to his questions as to how the engines and scoop have succeeded in charge of my men, I can say that men require experience in order to work efficiently and economically. My first tank—contents 23,740 cubic yards—I reckon cost 1/10¾ per yard, which includes charges for repairs, also 20% per annum for interest and wear and tear; depth, 21 feet. The second tank, 17,787 yards, cost £533 9s. 1d., or 7¼d., depth 14 feet; the third tank, 18,857 yards, cost 8½d., £676 9s. 10d.; the fourth tank, 8,068 yards, cost 8¼d., £279 11s. 3d., depth 17 feet; the fifth tank is now being made. The engines and scoop arrived at Menindie Station, October, 1881. I refer you to enclosed statement of cost of 8,068 cubic yards, or the latest work completed.

Yours truly,
HERBERT B. HUGHES.

STATEMENT of cost of excavation made by engines and scoop of Messrs. John Fowler & Co.'s make, at the East Balaklava Tank, Menindie Run, New South Wales:—

1884.	£	s.	d.
February—To wages	28	3	8
March— ,, ...	68	10	11
April— ,, ...	43	0	0
,, To kerosene, &c....	1	12	0
February—To rations	10	13	6
March— ,, ...	12	12	10
April— ,, ...	12	14	4
To interest 10%, wear and tear 10%, on cost of plant £3,365 12s. 11d. for two months	112	4	0
	£279	11	3

8,068 cubic yards excavated, at 8¼d. = £279 11s. 3d.
5,203¼ cubic yards had been previously taken out by bullocks.

13,271¼

Kinchega, 9 May, 1884.

H. T. PHILLIPS, Manager.

The above tank is 101 yards long × 42 yards wide and 17 feet depth.—H. T. PHILLIPS.

Mr. A. H. Doudney to Messrs. John Fowler & Co.

Dear Sirs, Steam Scoop Camp, Government Tank Works, Babinda *via* Nyngan, 2 August, 1884.

You will be pleased to hear I arrived here safely with the plant twelve days ago, and that we have made considerable progress in the work here.

We have had to do an immense amount of clearing so as to make room for the engines to work, and it is chiefly on this point I am addressing you.

I think you should be made aware of the wonderful faculty your engines possess for clearing land. In three days, with one engine, I rooted up and dragged away very nearly 400 trees, varying in size from saplings to trees 2 ft. 6 in., and 3 ft. through.

In the 15 acres of clearing, I never had so much as to even ease the roots, and the people who witnessed the performance declared it marvellous.

I have pulled as many as fifteen trees down without shifting the rope, by means of the bight of the rope. We would run the rope out, making a half circle, and fasten the end of the rope to the butt of a tree. Then as the strain came on, the bight of the rope would (by means of forks) be shoved pretty high up the tree, on which the strain would come, and over would go that tree. The engine would wind in again, and as the rope tightened it would be forked up the next tree, on which the strain of the bight would come. And so on, until all the trees would be down, excepting the one on which the rope is made fast; the rope would be forked up on this one, and she would then come.

Chain slings are a mistake—the slightest jar and the links snap. I simply put the rope round the tree, and shackle on to the standing part. The larger the tree, as a rule, the easier it comes, the head of the tree being of great assistance.

With one 16-horse power, a van truck (for the camp), a water-cart and two horses, three men and a driver, an energetic man could make a fortune, taking contracts for clearing bush roads. In this direction there is a great opening, as against the old style of grubbing and burning off.

I am, &c.,

A. H. DOUDNEY.

Mr. A. H. Doudney to Messrs. Fowler & Co.

Dear Sirs, Steam Scoop Camp, Babinda, *via* Nyngan, 6 August, 1884.

Yours of the 4th instant duly to hand, and contents noted.

We are still continuing to show great progress, and there is more stir and excitement about the plant amongst the district and passers-by than I have ever before observed.

You will be pleased to hear that, following your Mr. Greig's advice—re-fixing up the worn guide-blocks,—I have got the coiling gear on both engines to work A 1.

The new scoop is upon the point of starting from Sydney for here. I have had oil-cups fixed on the wheels, in the place of the old style of oil-holes and wooden plugs. The flow of oil I have regulated by means of a leaden bullet inside the oil-cup. When the cup comes up, the bullet falls over the vent and blocks the oil; she therefore lubricates only whilst the cup is horizontal. It is just an idea of mine, and I hope it will answer. The wooden plug style is bad. Every time the plug is taken out dirt falls in, and much time is lost in the frequent oilings.

I have been looking over the particulars of new scoop, and am highly pleased. I note the axle arms are much larger in diameter and 3 inches longer; this I attach great importance to, because it is impossible always to avoid pulling the scoop a little sideways, and that is the time when the axle arms feel the strain. I do not believe in the bell mouth; a straight scoop (with mould boards on the wheels to prevent their running over the ploughing and keeping the mouth up) would fill better, easier, and take more dirt by far, and there would be infinite less clogging of damp earth. This is Bisset's idea, and the more I study the matter the more convinced I feel that Bisset's view is right.

I am, &c.,

A. H. DOUDNEY.

Mr. J. W. Jones to Mr. Greig.

Sir, South Australia, Department of Water Conservation, Adelaide, 11 August, 1884.

Your visit to Adelaide gives me a fitting opportunity of saying that the six sets of steam scooping machinery supplied by your firm to the Government of this Colony have, after a trial of a year and a half, been found to be of very high-class workmanship and quality, reflecting much credit upon your establishment.

The traction engines have been found fully capable of hauling the entire set of machinery, camp equipage, &c., &c., over the natural roads in the interior to the various sites of operations in reservoir excavating, in most cases from 50 to 100 miles from the railway.

The engines have been worked entirely with the native wood of the locality, and in many cases under great difficulties, with very brackish water, often as salt as the sea. This has, however, necessitated very frequent washing out, and should be avoided as much as possible.

In ordinary work the engines and other appliances are strong enough, but occasionally very unusual strain has caused the breakage of the brackets, and the upright shaft and some minor parts, which I have already pointed out to you That is very easily remedied, and indeed might never have occurred with more experienced men.

As to the actual results of scooping, and this is, of course, the main point I have to consider, I am now in a position to judge with some authority, for several reservoirs have been completed to 20 feet deep, with a capacity of about 25,000 yards each, the slopes being 3 to 1, and the bulk of spoil removed 150 feet, to form embankment 10 feet high.

The cost of first reservoir was, including wages, transport, supply fuel, forage, stores, &c., &c, 1s. 1½d. per cubic yard. Some others have cost about the same, and in one or two cases where the difficulties of transport of machinery and supplies—60 miles, and cartage of fuel and water, 10 to 15 miles—the cost has been greater. It must be remembered, however, that every man employed with the machinery has had to be educated to the work, and this has been a matter of much difficulty. In future the danger of accidents should be much lessened, and the cost of excavating materially reduced.

It is a very great point in favour of the machinery that the depth is no difficulty; from 20 feet to 30 feet may be attained as easily as 10 feet. and our results have shown us that this can be done at the same price as the first 10 feet. This is of the utmost importance in these works, as previous to the introduction of the machinery the reservoirs and dams seldom exceeded 12 feet deep, in consequence of the difficulty in getting contractors to go deeper, and also the very much increased rate for every foot deeper, and as the evaporation is from 60 to 80 inches per annum, the importance and value of deep sinking, to prevent evaporation, can be adily estimated.

The contract rates to 15 feet deep have, in out-lying places, ranged as high as 2s. 6d. to 3s. per cubic yard. With the experience the men have now had in working the machinery, and when some necessary alterations are made to the scoop, I am fully satisfied that much better progress will be made, and the cost per cubic yard materially reduced, and that the machinery will give very general satisfaction.

I have, &c.,

JAMES W. JONES,

Conservator of Water.

[*Ordered*

[*Ordered by the Commission to be printed*, 28 *August*, 1884.]

Mr. D. Greig to The Secretary, Royal Commission on Conservation of Water.

Sir, 43, York-street, Wynyard Square, Sydney, 21 August, 1884.

Having just returned from seeing six sets of our steam scooping-tackles at work in South Australia, I am in a much better position to speak on the question of my scoop excavating machinery than I was when examined before the Commission on 1st July.

I have been very agreeably surprised to find the machinery much more perfect in its detail than I expected to find it. The six machines I saw were working with the greatest regularity and doing the work in the most satisfactory manner. I have tried to get as much information as possible as to expense, &c., and I have forwarded to you the result in a pamphlet, twelve copies of which have been left at your office.

It is quite clear that in the starting of these machines the want of knowledge has added most materially to the expenditure, and has been the only drawback. The question of men is not now got over, as they are continually educating new hands, and I have no hesitation in saying that the amount of work done per day is more than doubled, and with certain improvements, which I see my way to make, we shall be able to take out a much larger quantity of dirt at the same expense. So far as I see, I apprehend no difficulty in taking out the earth at 6d. per cubic yard.

The slopes of the tanks and of the embankments were very nearly mathematically correct, and no one could see them without being pleased with their regularity.

Begging to be excused for thus trespassing on your time,—

I am, &c.,
DAVID GREIG.

APPENDIX A 1.

LIST of the River Gauge readings received from the Harbours and Rivers Department.

Murrumbidgee Improvements.

- Gundagai .....August 1st, 1876, to March 31st, 1877; May 1st, 1877, to December 31st, 1877; May 1st, 1880, to February 28th, 1881.
- Wagga Wagga...August 1st to 31st, 1876; October 1st, 1876, to March 31st, 1877; May 1st to October 31st, 1877; May 1st, 1880, to February 28th, 1881.
- Narandera .....August 1st, 1876, to January 31st, 1877; March 1st to 31st, 1877; May 1st to November 30th, 1877; May 1st, 1880, to February 28th, 1881.
- Hay.....Weekly observations during August, September, October, 1876. Daily observations began November 1st, 1876, to February 28th, 1881.

Murray River.

- Tide gauges at Wahgunyah, Echucha, and Swan Hill. Observations taken weekly with barometer, thermometer, and remarks. January 6th, 1869, to February 24th, 1869; April 14th, 1869, to June 26th, 1872. Daily observations of water gauge, and time taken by a float to pass over 300 yards.
- Swan Hill.....August 1st to December 31st, 1872; January 1st to 31st, 1873.
- Euston ..... August 18th, 1872, to May 31st, 1874; July 1st, 1874, to December 31st, 1874; January 1st, 1877, to May 31st, 1878; July 1st, 1878, to April 30th, 1879.
- Custom-house ...October 1st to 31st, 1872; December 1st to 31st, 1872.
- Albury .....January 1st to September 30th, 1873; November 1st to December 31st, 1873; January 1st to February 28th, 1874.
- Tocumwall.....September 1st, 1872, to September 30th, 1873; November 1st, 1873, to May 31st, 1874; July 1st, 1874, to November 30th, 1874.
- Corowa .....August 12th to 31st, 1872; October 1st to 31st, 1872; January 1st to 31st, 1873.
- Mildura Gauge...Weekly readings, October 10th, 1869, to August 28th, 1870.

Darling River.

- Albemarle.....Daily observations of the height of the Darling River, May 7th to August 24th, 1870; September 1st, 1871, to April 19th, 1872; April 27th, 1872, to May 24th, 1872; June 1st to July 12th, 1872; July 26th to August 31st, 1872. Table of errors.
- Wentworth .....Daily observations, September 1st, 1872, to September 30th, 1873; November 1st, 1873, to April 30th, 1874; August 1st, 1874, to December 31st, 1874; December 1st, 1876, to August 31st, 1877; October 1st, 1877, to June 30th, 1879; August 1st, 1879, to October 31st, 1880; and December 1st, 1880, to February 28th, 1881. Some broken observations, no year mentioned, but fastened to the Albemarle returns of 1870. September 12th to November 11th; April 7th to August 22nd.
- Bourke .....Daily observations. September 1st to October 31st, 1872; December 1st to 31st, 1872; February 1st to September 30th, 1873; November 1st to December 31st, 1873; January 1st to March 31st, 1874; May 1st to 31st, 1874; and August 1st to 31st, 1874.
- Extracts from Darling River gauge reports, from September 1st, 1871, to July 26th, 1872. Look like monthly means.

Sydney Observatory, July, 1884.

APPENDIX A 2.

TABULAR Statement showing the Mean Height above Summer Level of the River Murray for each Month of the Year, at Moama, from July, 1863, to December, 1883, inclusive.

Prepared by C. E. Gordon, Esq., H.M. Customs, Moama, 1863 to 1878.

Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Date and max. height.
	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
1863	.....	.....	.....	.....	.....	.....	11 0	26 2	30 4	28 11	28 8	21 1	23 Sept. ... 30 6
1864	13 3	5 3	3 1	4 5	5 4	7 2	11 11	20 11	21 7	23 3	21 8	8 9	4 Nov. ... 27 6
1865	5 7	5 6	2 7	0 6	2 2	4 0	4 1	5 2	14 0	11 6	7 5	2 9	23 Sept. ... 18 4
1866	0 9	0 6	0 0	0 3	2 5	5 6	10 6	17 6	18 8	20 2	14 11	9 10	29 Aug. ... 23 9
1867	5 7	2 9	1 4	1 3	3 6	4 6	13 6	24 2	24 11	32 9	25 7	9 7	16 Oct. ... 34 5
1868	3 3	2 10	2 1	1 9	1 11	2 10	9 5	9 9	9 8	16 4	8 5	4 4	14 Oct. ... 18 3
1869	0 9	0 7	0 2	4 8	2 8	8 1	11 6	9 1	7 1	15 1	15 9	6 5	3 Nov. ... 20 10
1870	4 0	2 1	0 1	2 6	7 0	15 9	29 0	29 3	32 4	29 5	33 8	18 8	6 Nov. ... 38 0
1871	10 5	10 8	10 5	5 1	6 0	6 7	12 3	16 6	17 6	26 0	19 5	17 8	11 Oct. ... 28 7
1872	9 7	5 8	2 7	1 3	4 5	12 1	26 0	26 0	21 2	24 5	22 10	18 0	26 Oct. ... 29 4
1873	11 10	5 8	5 4	3 6	8 0	9 3	17 4	22 0	25 0	21 7	15 6	12 5	10 Sept. ... 25 4
1874	6 3	5 5	3 7	8 6	6 9	14 5	23 1	22 11	23 3	24 8	19 10	10 7	10 Oct. ... 28 8
1875	4 7	4 5	2 8	1 11	6 7	19 1	27 11	26 0	28 10	25 3	20 9	16 9	16 Sept. ... 30 7
1876	11 11	6 7	3 3	3 11	4 6	8 3	7 5	11 9	12 5	16 11	11 8	9 7	10 Oct. ... 18 4
1877	3 7	1 10	1 5	1 1	3 8	16 0	13 9	9 4	8 0	13 11	9 2	5 2	26 June ... 18 4
1878	1 6	2 0	7 3	10 1	12 8	13 3	20 10	23 8	22 11	23 11	23 5	13 8	18 Nov. ... 24 11
1879	2 10	2 2	2 9	2 3	2 1	7 2	9 5	10 8	14 10	20 4	21 2	14 9	5 Nov. ... 24 8
1880	7 1	2 11	3 6	6 7	15 0	18 6	23 10	20 5	24 7	21 9	14 9	8 4	30 Sept. ... 27 3
1881	3 10	2 7	1 5	3 11	7 0	11 5	12 10	12 4	14 4	12 3	10 4	9 0	30 August 18 3
1882	.....	0 11	0 1	0 2	2 8	6 4	11 6	18 1	20 5	17 1	13 4	10 4	18 Sept. ... 22 0
1883	4 6	1 7	0 10	1 7	1 4	4 10	13 3	17 11	24 0	22 2	22 0	12 8	6 Sept. ... 25 9

APPENDIX A 3.

APPENDIX A 3.

RAINFALL recorded at Deniliquin, 1863 to 1883.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	December.	Total.
	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches
1863	2·080	1·680	0·300	1·920	1·380	2·340	2 500	2·120	1·860	4·530	0·420	1·510	25·380
1864	1·770	0·400	2·880	3·630	0·120	1·330	0·460	1·190	1·060	0·130	... ..	0·050	13·020
1865	.....	.....	.....	0 200	0·190	0·020	0·240	0·060	0·060	0·040	0·030	.....	.....
1866	2·100	.....	.....	.....	... .	.....	.....	.....	.....	.....	.....	.....	.....
1867	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1868	1·060	1·790	0·760	1·100	0·270	0·680	2 070	0·910	2·150	0·240	1·560	0·100	12·690
1869	1·580	0·150	2·770	0·440	0·580	1·020	1·370	0·120	0·850	1·770	1·800	.....	12·450
1870	1·115	... .	0·320	2·220	3·380	2·900	0 370	2·580	4·290	4 910	0·270	1·690	24·045
1871	1·640	3·950	0·010	0·660	3·080	0·880	0 790	0·670	2·870	1·660	3·460	1·100	20·770
1872	0·140	0·170	0·570	0·780	0·960	3 890	1·730	1·020	1·670	2·870	2·970	0·620	17·390
1873	0·060	1·990	0·800	1·550	3·280	5·050	1·730	4·060	1·650	1·620	0·870	1·480	24·140
1874	1·710	.....	3 350	2 970	1·890	1·910	1·540	0·710	2·500	1·500	0·050	0 140	18·270
1875	0·060	1·990	0·800	1·550	3·280	5·050	1·730	4·060	1·650	1·620	0·870	1·480	24·140
1876	0 430	0 230	1·470	0 040	3·580	0 090	0·170	1·790	1·530	0·660	3·670	.....	13·660
1877	0·590	0·670	2·490	0·320	2·140	1·560	0·860	0·110	2·700	0·760	0·430	.....	12·630
1878	.....	7·390	8·880	2·320	0·290	1·190	3·220	0 640	1·000	2·420	0·750	.....	28·100
1879	0·500	0·150	0 430	1·950	0·950	0·710	1·220	1·890	1·410	3 450	1·290	0·330	14·280
1880	0·600	2·270	2·640	4·000	0 440	0·720	0·420	0·380	1·820	0·750	0·360	0·190	14·590
1881	0·500	2·330	2·570	0·140	1·940	1 700	0·440	0·770	0·960	0·970	0·760	0·540	13·620
1882	.....	0·020	0 070	2·670	1·350	0·470	1·100	2·160	0·340	3·560	2 590	0·740	15·070
1883	0 120	1·020	2·070	0·750	1·950	1 400	0·360	1·790	1·570	1·880	1·300	0·600	14·820

APPENDIX A 4.

RAINFALL recorded at Albury, 1863 to 1883.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	December.	Total.
	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches
1863	3·870	2 520	1·740	8·640	3 280	1 860	2·590	3·780	2 530	4·120	2·000	1·820	38·750
1864	0·740	1·220	2·030	7·300	0 720	3·760	3·380	3·750	4·920	1·370	... ..	2·080	31·270
1865	.....	0·640	1·010	1 310	5·320	2·170	7 990	4·620	1·640	1·240	1·160	0·550	27·650
1866	3·100	0·700	.....	2·500	2·500	3·000	3·000	7·600	1·000	2·300	1·500	2·100	30 300
1867	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1868	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1869	.....	. ....	.....	.....	.....	.....	.....	.. ...	.....	.....	.....	.....	.....
1870	.....	.....	.....	.....	.....	.....	.....	.....	3 670	9·570	1·640	1·530	.....
1871	2·190	4 279	0·330	1·090	2 250	1·840	2·030	1·290	6 820	3·190	3·350	2·200	30·859
1872	0·720	1·750	1·280	1·160	3·660	7·400	2·910	2 520	0·450	.....	2 080	4·520	28 450
1873	0·180	2·870	0·870	2·640	4·140	6·040	3·600	4·180	2·640	1·900	2·480	3·200	34·300
1874	4·890	no recrd.	4·490	1·920	2·970	3·380	2·600	1·630	2·780	2 960	0·100	0·060	27·780
1875	0·180	2·870	0·870	2·640	4·140	6·040	3·160	4·180	2·640	1·900	2·480	3·200	31·300
1876	0·200	0·250	2·700	0·100	3 650	0 920	0·770	2·390	3·090	1·810	3 880	0·750	20·510
1877	0·620	0 920	2·160	1·660	3 080	3·560	1·370	0·700	2·950	1·000	1·030	1·800	20 850
1878	0·060	3·530	4·260	3·310	0·500	3·890	3·880	1·930	3·950	4·500	3·020	.....	32·830
1879	0·520	2·800	1·630	1·380	1·630	2 010	2·830	2 730	3·530	6·060	2·710	0·940	28·770
1880	0 860	1·290	4·270	5·200	2·620	2·590	1·030	2·130	1·970	2·640	0·700	0·650	25·950
1881	0·240	4 600	4·670	0·740	2·370	3·240	1·040	1·600	1·190	1·100	1·520	1·490	23·800
1882	0·410	0 080	0·950	1·970	3·820	1·380	2·420	3·610	1·060	2 750	3·030	0·940	22·420
1883	0·150	1·590	1·510	0·770	1·270	3·110	2 300	2·600	3·170	5·120	1·520	0·390	23·500

APPENDIX A 5.

RAINFALL recorded at Brewarrina, 1872 to 1883.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	October.	Novr.	December.	Total.
	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches
1872	1·270	0 900	.....	0·430	0 840	3·360	1·320	0 410	0·710	2 660	3·120	2·560	16·770
1873	3 920	1·550	0·680	2·050	2·750	7·570	0·370	0·600	2 350	... .	1·540	.....	23·380
1874	13 950	3·750	10 770	0 260	0·800	1·030	2·100	.....	1·500	. ....	... .	.....	34·160
1875	... ..	.....	0·500	3 390	3 180	1·170	3·270	0·540	0 230	0 200	.....	.....	12·480
1876	1·520	. ...	3 880	3·860	3 630	2·050	.....	2·670	.....	.....	2·730	0 340	20 680
1877	1·380	1·840	2·490	.....	0 370	2·350	0·090	.....	6·640	... .	.....	1·450	16·610
1878	0·100	1·400	1·350	0·150	0 700	1·810	1·630	.....	5·220	2·770	3·300	0·940	18·740
1879	.....	3·530	2·040	1·880	3 100	1 550	2·510	2·110	2 270	1·700	1·920	1·200	25·810
1880	2·100	13·410	1·220	7 040	.....	.....	.....	.....	2 730	1·000	.....	.....	27·500
1881	3·850	0·660	2·740	.....	1 640	0·540	.....	0·620	1·270	2·160	2·140	0·140	15·760
1882	.....	7·030	0·710	2·920	2 280	1·690	0·240	0·110	0·110	2·140	2 920	0 980	21·130
1883	.....	1·500	1·340	0·960	1·420	0 500	for 6 months 4·180						9·450

Rainfall recorded at Armidale, 1870 to 1883.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	December.	Total.
	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches
1870	No rain	gauge.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....
1871	.....	.....	.....	.....	.....	2·590	1·110	1·440	0·350	2·870	4·590	3·790	16·740
1872	7·980	4·290	3·130	0 320	0·180	1·520	2·190	1·100	2·080	5·730	1·880	3·220	33·620
1873	6·920	3·670	1·870	1·330	1·340	3·700	0·820	1·890	0 760	1·060	2·250	3·100	28·710
1874	2·100	1·650	0·050	1·540	0·320	0·700	0·180	1·620	1·460	1·960	2·496	2·530	16·606
1875	1·690	4·930	3·280	3·770	3·840	1·240	3·680	3·040	3·270	2·290	3·350	3·160	37·540
1876	0·452	2·300	2·520	3·210	5·500	6·520	4·580	1·460	5·100	3·610	3·030	7·450	45·732
1877	7·270	0·770	2 560	0·500	3·230	.....	.....	1·990	2·100	1·830	1·030	2·870	24·150
1878	2·360	12·370	2·510	0·280	1·480	1·360	2·960	1·120	5·730	2·770	0·600	2·920	36·460
1879	2·730	7·230	4·930	2 730	4·850	3·640	1·790	7·040	.....	0·260	1·460	4·480	41·140
1880	0·780	0·110	4·900	2·960	1·760	2 400	1·610	0·210	4·610	3·380	3·920	2·410	29·050
1881	7·320	1·420	0·910	1 060	1·120	0·540	1·160	1·850	3·020	1·760	2·120	0·550	22·830
1882	0·690	5·860	1·010	2·180	0·980	3 270	2·040	1·160	0·250	3·300	4·830	2·780	28·350
1883	4·600	4·210	1·390	3·670	3·110	0·210	0·620	1·350	1·720	5·340	3·670	2·140	32·080

Rainfall recorded at Narrabri, 1870 to 1883.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	December.	Total.
	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches
1870	.....	.....	.....	.....	.....	.....	.....	... ..	.....	3 220	3·650	3·230	.....
1871	1·600	2·255	3·910	3·200	3·190	0·510	1·490	1·050	0·320	2·460	1·780	1·940	23·705
1872	4·880	0·380	0·430	0·280	0·620	1·670	2·260	1·030	2·510	3·960	3·170	3·690	24·880
1873	3·490	1·850	2·640	0·250	0·120	9·710	0·110	3·640	0·680	1·190	3·910	4·750	32·340
1874	8·270	4·100	1·880	1·770	0·440	1·060	4·840	0·720	1·250	1·700	1·680	0·310	28·020
1875	0·360	1·670	1·540	1·940	3·300	3·320	1·840	0·380	0·890	2·580	1·870	0·690	20·380
1876	1·580	.....	0·985	2·170	3·940	2·890	3·150	1·300	2·320	0·620	1·830	4·360	25·145
1877	3·670	0·470	4·960	0·170	.....	0·980	0·490	0·800	.....	0·590	0·430	1·970	14·530
1878	0·510	14·280	2·000	0·960	0·600	1·650	3·450	0·260	3·190	3·950	4·650	1·140	36·940
1879	1·260	9·640	1·700	1·100	4·950	0·050	1·790	3·490	3·940	0·840	1·430	4·510	34·700
1880	2·690	2·090	2·950	3·500	0·660	0 060	0·690	0·380	2·070	0·730	0·600	1·740	18·160
1881	3·640	2·190	2·220	.... .	1·720	0·390	0·350	1·780	2·440	1·270	3·200	0·050	19·250
1882	0·050	7·290	0·640	2·220	2·850	1·820	0 020	1·130	.....	2·270	3·580	0·860	22·730
1883	0·970	1·550	0·440	3·090	3·320	0·150	0·150	1·290	0·460	1·390	1·290	0·060	14 160

Rainfall recorded at Bourke, 1871 to 1883.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	December.	Total.
	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches
1871	.....	.....	.....	0 070	1·258	0 790	0 120	0·130	1·880	0·700	0·560	1·100	6 698
1872	6·030	3·460	0·080	0·360	0·590	3 360	1·920	0·520	absent	1·580	2·010	4·090	24·000
1873	2·530	0·820	0·230	1 960	0 750	2·450	.....	no record	0·960	0·100	1·140	0·960	11·900
1874	12·240	1·620	5·730	no rain	recorded	0·740	0·850	0·350	1 940	station	burnt	down	23·470
1875	.....	instrume	nts not	replaced	.....	0·590	0·970	0·410	0·380	0 170	0·200	0·130	2·850
1876	.....	0 040	1·650	0·840	2 030	0·700	1·490	2·140	.....	.....	2·460	0·270	11·620
1877	.....	.....	.....	0·160	0 040	1·060	0·040	.....	2·100	0·010	0 050	0·710	4·170
1878	0·240	2·860	1·450	0·270	0·020	0·060	0·300	0·750	3·850	1·580	1·680	0·250	13·310
1879	0·060	2·890	0·710	3·010	2·330	0·980	1·090	2·170	1 230	1·530	1 320	0·040	17·360
1880	1·900	11·160	0·250	7·190	0·120	.....	.....	.....	1·960	0·690	.....	0·010	23·280
1881	1·830	1·340	2 250	.....	1·670	0·350	0·060	0 190	1·150	1·000	6·260	0·260	16·360
1882	0 710	7·320	0·010	2·620	0·550	1·340	0 300	0·320	0·080	1·600	5·860	1·760	22·470
1883	.....	1·210	1 280	0·300	2·310	0·110	.....	0 780	1·120	3·130	0·190	0·680	10·110

Rainfall recorded at Inverell, 1874 to 1883.

Year.	January.	February.	March.	April.	May.	June	July.	August.	Sept.	October.	Nov.	December.	Total.
	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches
1874	.....	2·480	1·000	1·960	0·650	1·890	6 100	1·340	2·720	2 000	1·090	.....	21·130
1875	2·790	2·910	3 060	1·890	2·530	1·330	2 220	0·450	1·440	1·150	1·300	0·620	21·690
1876	2·030	1·160	1·550	3·080	3·820	4 300	5·130	0·790	2·170	2·250	2·370	3·360	32·010
1877	7·210	.....	2·610	0·100	.....	1·100	... ..	.....	.....	.....	.. ...	.....	.....
1878	.....	.. ..	... .	.....	... .	... .	2 380	1·330	5 810	1 550	0·840	2·660	14·820
1879	1·490	6·190	7·810	5·590	5·980	0·510	2 340	4 910	4 250	2·190	3·780	2·680	47·620
1880	0·350	3·990	4·400	1·630	0·800	0 750	0 200	0·220	3·930	2 390	1·270	0·890	20·820
1881	3·850	1·580	1·570	0·030	1·380	0·560	0·450	1·730	3·090	2 880	2·730	0·730	20·550
1882	1·130	2 660	2 270	2·500	.....	1·170	1·230	0·790	.....	6·360	2·130	3·910	24·150
1883	4·550	7·390	1·440	1·900	2·480	0·100	0·790	1·370	1·750	3·800	1·730	2·060	29·360

Rainfall recorded at Bathurst, 1870 to 1883.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	December.	Total.
	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches
1870	3·280	1·330	5·580	5·660	2 990	0·990	1·890	2·600	1·650	3·920	3·800	2·430	36·120
1871	1·940	6·530	1·600	1·740	2·850	0·940	0 740	0·470	1·080	1·300	2·150	1·560	22·900
1872	2·520	2·380	1·200	0·100	1·160	1·820	2·150	0·780	1·130	3·440	8·840	5·110	30·630
1873	4·060	5·090	1·010	1·370	0·620	4·550	0·460	2·200	1·220	1·210	3·550	1·160	26·500
1874	3·050	4·510	3 120	1·690	2·210	1·410	3·530	1·680	2 670	1·600	0·890	0·170	26·530
1875	1·430	4·060	0 400	1·250	2·870	4·330	1·220	0·710	1·050	1·630	1·570	0·540	22·050
1876	2·850	0·960	0·220	0 030	5·330	0·470	1·930	1·820	1·820	2 680	1·500	0·910	20 520
1877	1·390	0·900	3·100	0·930	3 370	0·880	0·910	0·400	2·020	1·480	0·590	1 750	17·720
1878	0·360	5·260	2·070	1·050	0·180	2·210	2·950	1·270	3·240	2·420	2·570	3·180	26·760
1879	1·630	2 920	1·550	1·560	4 710	0·960	2·640	4·140	5·030	2·710	3·350	1·150	52·350
1880	2·130	0·090	1·990	3·320	1·360	1 000	1·220	1·830	2 440	3·160	0·430	0·870	19 840
1881	2 340	5·030	1·770	0·560	1·600	1·460	0·620	1·240	1·760	2·230	2·090	0·490	21·190
1882	0·170	0·240	0·910	1·850	1·730	2·170	1·400	1·060	0·260	4·770	4·240	2·760	21·560
1883	0·860	2·760	1·620	1·870	2·820	1·040	0·960	2 270	2·370	2·210	2·150	0·860	21·790

Rainfall recorded at Dubbo, 1870 to 1883.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	December.	Total.
	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches
1870	.....	.....	.....	.....	.....	.....	.....	.....	0·880	4·560	4·220	3·180	
1871	1·730	3·560	2·160	0·570	1·630	0 250	1·160	0·710	1·880	0·580	0·870	0·400	15·500
1872	1·050	2 930	0·260	0 340	1·090	2·860	1·550	1·150	1·050	1·500	4·560	6·410	24·750
1873	2 890	2·730	1·070	0 840	1·230	7 390	0·850	0·600	0 240	no record,	observer	died.	17·840
1874	instru	ments	out of	order	2 020	1·150	2·990	1·170	1·980	.....	0·740	.....	10·050
1875	no record	3·930	0·980	1·410	2·010	4·380	2·100	1·190	2·350	1·070	0·810	0·470	20·700
1876	0·590	0·400	1·110	2·210	5·660	0·660	1·280	2·560	0·820	0·590	2·150	1·540	19 570
1877	0·760	.....	0·250	0 870	1·500	1 570	0·330	0·070	2 300	1·670	0·260	2·010	11·590
1878	0·750	1·130	2·660	0·870	1·940	1·500	1·810	0 870	4·400	1·760	4·230	1·630	23 550
1879	1·030	4·260	1·320	2 390	4·340	0·590	1·520	5·510	5·770	2·950	0·210	0·190	30·130
1880	2·490	1·360	1·550	0·570	0·730	1·090	0·390	0·360	3·600	1·260	0·110	0·320	19·830
1881	1 900	0·340	1·290	.....	1·370	1·200	0·650	2·270	1·340	0·840	2 000	0·120	13·320
1882	.....	1·330	0 070	0 820	2·990	3·170	1·540	1·270	0·130	4·650	1·530	1·730	18·630
1883	0·470	1·720	1·130	0 790	1·990	0·170	0·290	1·340	0·340	3·090	1·100	.....	12·430

Rainfall recorded at Mudgee, 1870 to 1883.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	December.	Total.
	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches
1870	... ..	.....	.....	.....	.....	.....	...	3·895	0 660	3·540	3·980	4·250	.....
1871	1·900	2·490	absent	0 680	3·760	1·530	1·150	1·610	1·980	1·890	1·540	2·570	21·100
1872	2·060	1·620	1·220	.....	1·480	3·600	1·580	1·360	1·730	2·950	4·680	10·540	32·820
1873	3·500	2 158	no record.	1·010	0·600	7·230	0·460	2 270	1·910	0·890	2·380	1,230	23·638
1874	7·820	3·240	3·570	1·130	1·020	2·200	5·780	1·640	3·510	2·250	2·330	.....	34·490
1875	1·390	Telegraph Station being repaired—no records taken.											
1876	... ..	.....	1·240	0 300	5·410	0·840	1·730	2·550	1·270	1·710	2·810	0·900	18·760
1877	0·660	0·150	1 340	0·460	5 230	1·500	0 590	0 160	2·520	1 840	0 300	1·550	16·300
1878	0·510	9·770	4·040	0·910	0·250	1·580	4·620	2·100	5 080	2·670	2·510	3·790	37·830
1879	1·250	3·830	1·560	3·300	5·080	1·150	2·740	4·800	7·410	1·680	1·350	2·410	36·560
1880	1·340	... ..	1·630	4·240	2·840	0·890	0·370	1·420	3·420	1·140	0·790	1·100	19·180
1881	1·440	2·680	0·900	0·270	1·620	1·690	0·310	2 330	1·270	1·480	3·260	0·990	18·240
1882	.....	0 560	1·080	0·880	1·930	2·270	1·920	1·110	0·100	6 390	2·020	3·220	21·480
1883	0 900	3 660	0·440	2·190	2·580	0·930	0·870	2·150	1·080	3·800	0·770	0·450	19·820

Rainfall recorded at Orange, 1870 to 1883.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	Sept	October.	Nov.	December.	Total.
	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches
1870	.....	.....	.... .	.....	. ...	.....	... .	.....	3·090	7·620	5 630	4·070	.. ...
1871	3·050	8 700	4 940	0·880	3 340	1·670	2·060	1·630	2·110	2·080	2·290	1·730	34·480
1872	3 450	2·190	1·020	0·580	3·880	7 570	4·450	1·810	2·870	4 920	7·680	5 790	46·210
1873	2·280	4·390	1·550	3·010	1 040	7·510	1·380	5·790	2·120	1·350	4·990	0·900	36·310
1874	4 950	8·770	4·790	2·170	4·850	4·770	4·640	4·740	5·260	2·620	2·120	0·370	50·050
1875	2 610	6·140	1 530	2 200	6 310	7·480	3 750	2 380	2·300	1·660	1·350	0·500	38·210
1876	1·760	1·100	1·080	0 430	8·390	0·910	3 240	3·850	3·810	2 210	2·830	1 550	31·160
1877	2·330	1 030	2 140	1·500	5·480	.....	.....	0 520	3·580	2·480	0·200	2·370	21·630
1878	0·700	8 240	8 610	1·230	0 290	5 090	5·450	2·680	5 870	4·100	5 280	2·950	50 490
1879	1·350	4·440	2·840	2 440	7·120	1·670	5·550	7·670	6·990	4 200	4·690	3·310	52·270
1880	1 950	0 070	2 000	4 290	2 520	2·730	1·350	2 910	4·440	6 990	0·500	1·230	30·980
1881	2 300	3·610	4 560	0·470	4·410	5·480	1·240	2·540	1·510	2 610	3·180	0 310	32 220
1882	0 260	0·270	0 760	1·250	3·870	3·960	2·420	2·490	0·400	6·160	6·270	2·670	30·780
1883	0·640	2·520	1·840	1·130	4·410	2·040	2·380	3 360	3·060	4·620	2·290	0·130	28 420

APPENDIX A 6.

P. H. Gell, Esq., to H. C. Russell, Esq.

Dear Sir, Overton, Urana, 27 February, 1882.

As you say in yours of January 31 that you will be glad to receive any memo. I may have as to our rivers, I send under separate cover two diagrams illustrating the flow of the Murray River for portions of thirteen years. The first is from observations made at Lake Victoria, near the boundary of South Australia, and of course below the junction of the Darling; the second made at Ki, near Euston, 60 miles above the junction of the Darling. The first is merely a record of the height of the river for part of the years 1863-4-6-7, and 8; the second shows an attempt made to ascertain not only the height, but the discharge of water in cubic feet per second, for part of the years 1870-71-72-73-74-75, and 76.* At the latter place I was kindly assisted by Mr. A. Woods, of the Harbours and Rivers Department, in making those cross-sections of the river-bed and also the ana-branches and flooded country opposite the station. I also had an accurately measured distance on the banks in order to observe the velocity of the current. I need not trouble you with an account of the various experiments tried to obtain the mean velocity. These have been reduced to a formula which I found to be this, nearly: "the maximum velocity multiplied by ·85 equals the mean velocity." The time taken by a float to pass the measured distance is given on the diagram. This column is a mean result of at least a hundred observations, but is only approximately correct, as the velocity varies so much with a high or low, a rising or a falling river. My calculations made some time ago, were made with the actual observed mean velocity at the time. There is also a column of the area of water-way at each foot in height, but I used the computed area for every inch in making the calculations. Of course this attempt made by an untrained observer to obtain some idea of the quantity of water discharged by the Murray is not what one could wish; but so far as I am aware nothing of the sort has been previously attempted, and there may come a time when these early notes may have some value as a record. When I sold Ki the new proprietor did not reside, and his manager was not competent to keep the record, which I regret, as so grand a rain gauge deserves a record. There are some memos. on the first plan showing when came the water causing the rise. These will, by a comparison with the rain records, show how different circumstances alter the time taken by rain to reach the lower river. As a general rule the higher the river the quicker the wave travels. This from several causes, that are not of equal power. With a low river the obstructions are greater, also the distance, and the level reaches to be filled more numerous. With a high river, the surface on which the wave travels is itself moving quicker. It is a matter of some importance to steamers, as navigable freshes have travelled down the Darling so slowly as to leave the upper river unnavigable before the boats could leave the Murray water. Local rains do not affect the height of the river in an appreciable degree. I observe a remark in your book on the Climate of New South Wales, with regard to the Murray, that you will permit me to notice. You say, page 8, that the Murray finds the ocean at Port Elliot in South Australia. Port Elliot is an open bay several (I think 7) miles from the Murray, which river finds the ocean at a place called the Murray Mouth, an opening in a sand-bank near Port Goolwa—a sand-bank that partially separates the water of Lake Alexandrina, through which the Murray flows, from the ocean. River steamers have many times steamed over the bar at the Murray Mouth, but the passage is dangerous and the river boats are altogether unsuitable for such navigation, and, in my opinion, any attempt to improve the channel would either be useless or involve a vast expenditure. After an inspection of the various proposed modes to connect the Murray and Darling with the sea, I, eighteen years ago, wrote a report published in the Adelaide papers, advocating the proposal to make a railway from Goolwa in Lake Alexandrina, to Port Victor on the coast, and works there to connect Granite Island with the mainland. These works are now slowly approaching completion. The Government in the meantime have spent a large sum of money in making a railway from Adelaide to Morgan, on the Murray, as a sop to the Adelaide property-holders. Although I have now been for so many years an interested and attentive observer of the navigation of the Murray, I have always thought that cheap railways would in a great measure supersede this risky and uncertain mode of transport, in spite of its cheapness. No doubt the river steamers have been of essential service in developing the interior, but it is in connection with irrigation, not navigation, that our rivers are of superlative interest in this dry country; and when I note the ease with which the Murray lends itself to works of irrigation I am astonished at the persevering though unorganized and ill-directed attempts to discover underground sources of water supply, whilst tons upon tons of water, easily available, are rolling uselessly into the sea every year. Your interest in the notes already sent encourage me to make some further remarks on the Murray River, as I know it from the mountains to the sea. For 100 miles above Albury the Murray River has the ordinary character of a mountain river, with a rapid current, in a rocky bed, in a comparatively narrow valley; the flooded ground is limited but rich, the hills poor and steep, the scenery picturesque. Below Albury the flooded country, intersected with ana-branches, shows its increased capacity, whilst the current is much slower, the total fall from Albury for the next 600 miles to the Murrumbidgee junction being only 320 feet. The head of the navigation may now be considered to be at Corowa; as far as I know, only two steamers have made Albury during the past five years. This is because there are railway facilities on the Victorian side above Corowa. Flooded gum and wattle trees are found along the banks to the junction of the Campaspe, about 325 miles by river from Albury; below that no more wattle is seen, and about 100 miles further the banks get lower, the level ground on either side opens out, and at Swan Hill, 500 miles from Albury, an enormous area of flat flooded country without timber extends on both sides. This was no doubt once a vast reed-bed or swampy lake, the feeding and treading of stock having now nearly destroyed the reeds; here the river in the high flood of 1870 only rose 13 feet above summer level: at the same time it rose 25 feet 100 miles lower down. The lip of the Swan Hill basin forms an obstruction in the river much dreaded by steamers, called the Bitch and Pups; and below it flooded box and gum line the banks, the flooded country being 5 or 6 miles wide, the river channel being sometimes on the north, sometimes on the south side; as it runs to the west, numerous ana-branches, locally called creeks, intersect the flooded country. The dry plains may be about 20 or 30 feet above the flooded country, but these plains are also intersected by ana-branches that carry water in such floods as 1870. The Wakool and Edwards, called rivers, can only be considered ana-branches, and join both the Murray and Murrumbidgee in high floods. 20 miles above Wentworth, at Mildura Station, is the only place where a bridge of moderate length would cross the water. Here both banks are high, and it is the best place I know for keeping a record of the discharge, as the whole of the water in flood-time is in sight of the station. Below Mildura the sandstone rock appears at low-water—a stratum of rock that seems to lie with great uniformity. For 150 miles more west, that is 80 miles west of Wentworth, this rock appears on the banks, and at Blanch Town, in South Australia, 1,300 miles from Albury, the river has cut through this rock so that it forms high cliffs on each bank. Below Blanch Town the flooded box ceases, and for 90 miles to the sea the river has more the character of an estuary of the sea, although quite fresh; indeed, the fresh water can often be traced quite through Lake Alexandrina—30 miles—although the lake is salt. The outlet to the sea is through a sand-bank of much the same character as the entrance to the Gippsland Lakes, and would soon be closed if the water brought down by the Murray did not keep it open. 15 miles above the boundary of New South Wales, Lake Victoria forms a large receiver of about 30 square miles, into which the flood pours for many months, to pour out during January, February, and March, by the Rufus Creek, mistaken by Sturt for a river running in from the north. You may ask do I think our rivers carry off our rainfall? So far as I know there are no data for a satisfactory answer, but my opinion is that increasingly they do. The treading of stock, and the consolidation of the surface, causes more water to reach the rivers than formerly, hence we may expect higher floods, and less low water. Sturt describes 90 miles of the Darling as salt. I have not heard of that since. I saw the Murray so low in 1866 that I drove over it in a buggy at Wentworth below the junction of the Darling. Mr. Corzier told me that he had seen it much lower, being then a mere chain of salt pools, with a run of fresh water from pool to pool. The ana-branch of the Darling, which now in high floods forms a supplementary channel joining the Darling to the Murray, had never in the memory of the oldest blacks been known to run through to the Murray water until the flood of 1864. The quantity of water it carried in 1864 will be seen by reference to my plan No. 1 in June and July, noting that at the gauge the Murray at that time was at least 7 miles wide, and very rapid. For the ten years before 1864, there had been a very great increase of stock on the Darling. No such flood in the Murray as 1870 could have happened for fifty years, as I could show.

I have said that the Murray lends itself to irrigation works, because I am credibly informed that a saddle which I have been over, but not examined, exists a few miles above Albury, where a channel could easily be brought from a low overshot dam in the Murray, so as to emerge from the Murray valley, without tunnelling or other expensive work. Once on the plains, the matter is only a question of time. It must also be remembered that the Murray is fed by snow-water from the mountains, and is not dependent on the irregular rainfall of the plains, or like the Darling, the uncertain extension south of the tropical rains. Thus we may make sure of a spring flood just at the time when the water is most wanted, and if

* The tabular statement only goes to Aug. 12, 1874. 1875 and 1876 will be found on the diagram.

if only the spring flood could be sent into the plains, who can say how much it might modify our Riverine climate. Now, looking at the enormous area of flat country below the level of the Murray at Albury, it is quite evident that there is not nearly enough water to irrigate half the land under the level of a gravitation channel, but one-fifth of the discharge would irrigate a million acres, and at 10s. per acre per annum (the lowest charge made anywhere), would give an annual income of £500,000.

Do I think that anything will be done in this matter? Certainly not; we live under the worst possible form of Government to carry out such works, even if our Ministers were superhuman. Fickleness, jealousy, ignorance, selfishness, are all against it. We have men who are willing to give liberally to our public institutions, but where is the man with the knowledge, the time, the money to carry out such a work, even with public funds? We want men like Sir Thomas Middleton, who made the New Cut, or the Duke of Bridgewater, but I am afraid our newspaper politicians would kill them.

The craze for individual liberty is adverse to any large combination, such as this undertaking would require—hence the persistent well-sinking, so poor, but under our circumstances, the best possible substitute. The squatters are particularly unable to combine; they are so used to be cocks on their own dunghills that they can't work together, and besides, the Land Law, whilst it induces them to put on bogus improvements as to those that might be shared by the public, says no; but I am wandering beyond my intention, which was to send you a few notes about the Murray River.

And beg to remain,
Yours faithfully,
P. H. GELL.

APPENDIX A 7.

HEIGHT and Approximate Discharge of the Murray River at Ki, Euston, from August 12th, 1871, to August 12th, 1874 = 36 months.

Date.	1871.		1872.		1873.		1874.	
	Height above sand-bars.	Discharge in cubic feet per second.	Height above sand-bars.	Discharge in cubic feet per second.	Height above sand-bars.	Discharge in cubic feet per second.	Height above sand-bars.	Discharge in cubic feet per second.
	ft. in.		ft. in.		ft. in.		ft. in.	
January 9			13 9	26,648	14 8	28,612	10 6	23,079
„ 19			11 9	22,990	14 7	28,314	7 10	18,075
„ 29			7 0	8,850	15 3	26,783	5 9	14,551
February 8			4 9	12,300	12 9	21,052	6 5	11,427
„ 18			6 0	12,780	9 5	18,077	6 3	11,354
„ 28			5 1	8,300	8 7	17,822	3 7	9,824
March 10			3 4	7,700	8 3	18,076	3 5	10,142
„ 20			2 3	7,350	7 2	16,652	3 3	10,373
„ 30			1 3	7,000	5 11	14,450	3 4	10,412
April 9			1 3	6,141	5 6	13,440	5 0	14,569
„ 19	No observations.		2 0	7,250	5 9	13,028	8 6	19,084
„ 29			1 6	7,430	4 5	12,120	9 6	19,777
May 9			0 11	6,600	4 9	11,480	8 9	17,652
„ 19			1 6	10,530	5 10	14,066	5 7	13,472
„ 28			2 2	950	6 7	15,679	5 4	13,458
June 8			5 9	16,900	6 9	14,900	7 7	14,472
„ 18			6 4	17,100	6 3	13,763	9 4	17,252
„ 28			8 3	18,870	7 6	13,525	10 6	23,482
July 8			9 6	19,777	9 0	18,097	11 5	25,761
„ 18			11 6	21,165	10 3	19,900	12 6	20,245
„ 28			14 4	30,162	11 5	24,832	14 4	31,732
August 7			18 2	30,162	13 0	28,288	16 7	38,108
„ 12	15 3	30,232	19 9	50,220	13 8	29,319	17 8	23,001
„ 22	14 4	30,219	20 5	67,434	14 6	31,436		
September 1	14 1	29,705	19 9	50,220	14 11	31,825		
„ 11	15 0	30,056	19 3	52,200	15 10	32,331		
„ 21	15 3	30,336	18 10	42,539	17 6	39,712		
October 1	14 10	29,900	17 8	37,401	18 9	46,680		
„ 11	14 6	29,614	16 10	36,549	18 6	46,300		
„ 20	15 7	29,375	16 5	32,513	18 2	45,793	No observations.	
„ 30	17 9	30,800	16 9	31,603	17 10	41,826		
November 10	19 5	37,570	17 9	37,485	17 10	39,168		
„ 20	18 11	48,806	19 10	50,112	15 10	36,358		
„ 30	18 3	46,620	20 3	60,554	13 8	28,518		
December 10	17 0	44,676	19 2	50,567	12 11	27,021		
„ 20	16 0	35,700	17 6	37,105	13 1	26,615		
„ 30	15 3	30,342	15 9	29,557	12 9	26,882		

During the season of 1871–2 the river was not navigable for 90 days.
„ „ 1872–3 the river was navigable all the 12 months.
„ „ 1873–4 the river was not navigable for 31 days.

When there is 4 feet of water on the sand-bars the river is considered navigable or steamers of light draught.

36 months average discharge, 25,887 cubic feet per second.
„ „ height, 11 feet 7 inches above sand-bars.

APPENDIX D 2.

Cost of Timber Weirs on Victorian Rivers.

Name.	Maximum Height.	Area of River Section.	Cost.	Cost per square foot of River Section.	Remarks.
	ft. in.		£	£ s. d.	
Teddywaddy, on the Avon	17 9	1,080	1,603	1 10 0	
Glenloth, do	15 0	774	1,626	2 2 0	
Boort Rd., do	14 6	625	1,464	2 7 0	
Glenorchy, on the Wimmera	.....	.....	7,000	.....	
Dooen, do	17 9	1,050	3,300	3 3 0	
Donald (Avon)	.....	.....	1,597	.....	
Wanulta Creek	14 0	977	1,430	1 10 0	
Cornella Creek	5 2	1,478	1,800	1 4 0	
Kerang, on the Loddon	14 6	1,961	5,210	2 12 0	
Kingpamil, do	16 0	840	3,780	4 10 0	Bad banks. Includes head sluice and embankment.
Pyramid Creek	9 0	614	1,504	2 9 0	Weir in middle of embankment.

APPENDIX D 3.

Cost of Pumping-station at Dooen, Wimmera Water Trust District.

Weir, including sluice and by-wash channel, &c	£4,231
Channel to pumps	451
Pumping-engine, pumps, shed, and cottage	2,164
9″ c.-i. pipes	3,242
	£10,088

G. GORDON.

APPENDIX D 5.

[*Extract from Reports of Board appointed to advise on the feasibility of giving a supply of water to the Northern Plains, Victoria.*]

The Wimmera Scheme.

* * * * * * *

We have availed ourselves of the best information existing as to the rainfall and the discharge of the rivers, but it is to be regretted that there is very little exact information on the latter subject. This is not of so much importance as regards this part of the inquiry, but it is absolutely necessary that more exact and complete data should be obtained before any extensive system of irrigation or large distribution of water for agricultural purposes can be considered; and we have accordingly taken steps to obtain the necessary information as to the discharge of the principal rivers in the northern division of the Colony, by establishing gauges and a system of registering the rise and fall at suitable points.

* * * * * * *

7. Before proceeding to describe in detail the works proposed, it is desirable that we should give a short description of the Wimmera River, its sources and watershed area, so as to convey an idea of its capacity as a source of supply, and that we should explain the basis of the subdivision and distribution proposed. Above Longerenong, the river may be described as consisting of two main branches, the east and the west, the former having its sources in the Pyrenees, and the latter in the Grampians, the area of the watersheds being respectively 790 and 550 square miles. Below Longerenong the river receives several tributaries from the left, viz., the Burnt Creek, the McKenzie River, Norton's Creek, and the Mia Mia Creek, having an aggregate drainage area of 520 square miles, but with these we are at present not particularly concerned, except as affording a supply to the river below the points at which the drain on its resources by the proposed scheme will terminate. Below the Mia Mia the river has no tributaries. From observations of the rainfall made at Hall's Gap, Stawell, Horsham, and Decameron (the latter kindly supplied to us by Dr. Williamson), it is estimated that the water supply from the eastern drainage area is to that from the western as 100 to 85 in average years, and as 100 to 99 in very dry years, while the supply from the tributaries below the junction of the main branches is to that of the total area above it as 27 to 100. The river ceases to flow in summer, although several of the tributaries are permanent streams near their sources, but the usual winter discharge is very considerable, and extreme floods have occurred, of which there is evidence that the discharge was enormous. In ordinary years the river may be said to terminate in Lake Hindmarsh, but the channel can be traced thence through Lake Albacutya for about 25 miles further to Pine Plains, where it finally disappears. Two or three times only in the history of the Colony has the river water been known to reach this point.

APPENDIX D 6.

Number of acres per square mile that could be irrigated in the Wimmera District, supposing that the whole of the supply could be impounded and applied to irrigation (which however is not feasible):—

The estimated discharge of the Eastern Wimmera in good average years is 8,546 million cubic feet, and of the Western Wimmera 4,754 million cubic feet; together, 13,300 million cubic feet. Allowing 10 per cent. for domestic use, &c., and 75,000 cubic feet as the quantity required per acre for mixed irrigation, exclusive of pasture, the number of acres that could be irrigated is about 160,000, or 58 per square mile of country commanded, but as some of the country would not be commanded by gravitation, probably 60 acres per square mile.

G. GORDON.

APPENDIX D 7.

AGRICULTURAL STATISTICS OF THE COLONY OF VICTORIA FOR THE YEAR ENDED 1st MARCH, 1884.

MEMORANDUM.—The following Tables relating to Irrigation are supplementary to the General Tables published in the Government Gazette of the 4th April. In the case of crops subjected to irrigation in any Shire, the extent of land not so subjected and so subjected is given in Table I; and the produce grown under each of those conditions in Table II. No figures are given respecting crops in any Shire of which no portion within such Shire was subjected to irrigation.

Office of the Government Statist, Melbourne, 22nd May, 1884.

HENRY HEYLYN HAYTER,
Government Statist.

TABLE I.—IRRIGATION IN CERTAIN SHIRES—LAND UNDER CROP.

Shires in which Irrigation was carried on.	Total Number of Farms.	Number of Farms on which Irrigation was carried on	Extent under Crop on Land—	Extent of Land under each description of Tillage.													
				Grain Crops.			Root Crops.		Hay.	Green Forage.	Artificial Grasses.	Other Crops.					
				Wheat.	Oats.	Barley.	Potatoes.	Beet, Mangel-wurzel, &c				Chicory.	Hops.	Tobacco.	Vines.	Gardens.	Orchards.
				acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres
Bacchus Marsh	197	4	Not irrigated	5,427	.....	.....	....	75	15	1,678	.....	251	.....	.....	... ..	.....	.....	.....
			Irrigated	465	.....	... ..	.....	10	13	24	.....	400	18	.....	. ..	.....	.....	.....
Bairnsdale	247	5	Not irrigated	4,939	.....	.....	.....	.....	.....	.....	.....	.....	.....	517	.....	.... .	.....	.....
			Irrigated	84	.....	.....	.....	.....	.....	.....	.....	.....	.....	84	.....	.... .	.....	.....
Beechworth	199	4	Not irrigated	4,046	.....	.....	.....	.....	.....	.....	.....	.....	.....	11	... ..	.... .	... ..	.....
			Irrigated	84	.....	.....	.....	.....	.....	.....	. . .	.....	.....	84	.....	.... .	.....	.....
Bright	184	3	Not irrigated	4,066	.....	... ..	... .	....	.....	.....	.... .	.....	.....	172	.....	.....	. ....	.....
			Irrigated	30	.....	.....	.....	.....	.... .	...	. ....	.....	.....	30	... ..	.... .	.....	.....
Creswick	326	3	Not irrigated	23,474	.....	.....	... ..	....	.....	.....	. . .	.....	.....	.....	.....	.....	38	41
			Irrigated	19	.....	.....	.....	.....	.....	.... .	... ..	.....	.....	.....	.....	.....	6	13
Echuca	967	3	Not irrigated	129,141	84,535	... ..	.....	.....	.. ...	13,699	. . ..	.....	... ..	.....	.....	.....	.....	.....
			Irrigated	285	135	.....	.....	.....	.....	150	.....	.....	.....	.....	.....	.... .	.....	.....
Eltham	128	1	Not irrigated	2,312	.....	.....	.....	.....	.....	.....	.....	.....	. ....	1	.....	.....	.....	.....
			Irrigated	8	.....	.....	.....	. .	.....	.....	.....	.....	.....	8	.....	.....	.....	.....
Lowan	1,176	1	Not irrigated	113,683	.....	.....	.....	2	.....	.....	.....	.....	.....	. ....	.....	.....	.....	.....
			Irrigated	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.... .	.....
Marong	846	6	Not irrigated	50,954	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	117	.....	536
			Irrigated	23	.... .	.....	.....	.....	.....	.....	.....	.....	.....	.. ...	.....	11	.....	12
Narracan	390	1	Not irrigated	28,565	.....	.....	.....	.....	... ..	.....	.....	.....	.....	24	.....	.....	.... .	.....
			Irrigated	12	.....	....	.....	.....	. ...	.....	.....	.....	.....	12	.....	.... .	... .	....
Newham	159	1	Not irrigated	8,613	.....	3,695	. ....	939	... ..	.....	.....	.....	.....	. . ..	.....	.....	.....	.....
			Irrigated	24	.....	18	.....	6	... ..	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oxley	399	34	Not irrigated	18,647	.....	.....	.....	.....	. . ..	.....	.....	.....	.....	45	.....	.....	.....	.....
			Irrigated	180	.....	.....	.....	.....	. ....	.....	.....	.....	.....	180	.....	.....	.....	.. ...
Strathfieldsaye	321	5	Not irrigated	7,450	.....	.....	... .	.....	4	3,166	34	111	.....	.....	.....	440	.....	348
			Irrigated	33	.....	... ..	.....	.....	1	8	6	2	.....	.....	... ..	5	.....	11
Swan Hill	1,241	88	Not irrigated	92,648	73,186	1,797	934	.....	.	10,703	.....	63	.....	.....	.....	.....	.....	.....
			Irrigated	5,580	4,833	76	49	.....	.....	599	10	13	.....	.....	.....	.....	.....	.....
Yackandandah	365	4	Not irrigated	8,951	.....	.....	.....	141	.....	.....	.....	.....	.....	... ..	283	663	.....	.....
			Irrigated	107	.....	.....	.....	13	.. ...	.....	.....	.....	.....	.....	7	87	.....	.....
Total	7,145	163	Not irrigated	502,916	157,721	5,492	934	1,157	19	29,246	34	425	.....	770	283	1,220	38	925
			Irrigated	6,935	4,968	94	49	30	14	781	16	415	18	398	7	103	6	36

TABLE II.—IRRIGATION IN CERTAIN SHIRES—GROSS PRODUCE.

Shires in which Irrigation was carried on.	Gross Produce of Crops grown on Land—	Quantity of Produce.								
		Grain Crops.			Root Crops.		Hay.	Other Crops.		
		Wheat.	Oats.	Barley.	Potatoes.	Beet, Mangel-wurzel, &c.		Chicory.	Hops.	Tobacco.
		bushels	bushels	bushels	tons	tons	tons	tons	cwt.	cwt.
Bacchus Marsh ...	Not irrigated ...	.....	.....	.....	150	282	2,123	.....	.....	.....
	Irrigated	.....	.....	.....	77	250	144	144	.....	.....
Bairnsdale	Not irrigated ...	.....	.....	.....	.....	.....	.....	.....	5,172	.....
	Irrigated	.....	.....	.....	.....	.....	.....	.....	1,035	.....
Beechworth	Not irrigated ...	.....	.....	.....	.....	.....	.....	.....	16	.....
	Irrigated	.....	.....	.....	.....	.....	.....	.....	912	.....
Bright	Not irrigated ...	.....	.....	.....	.....	.....	.....	.....	1,164	.....
	Irrigated	.....	.....	.....	.....	.....	.....	.....	234	.....
Echuca	Not irrigated ...	1,110,040	.....	.....	.....	.....	15,153	.....	.....	.....
	Irrigated	1,240	.....	.....	.....	.....	40	.....	.....	.....
Eltham	Not irrigated ...	.....	.....	.....	.....	.....	.....	.....	1	.....
	Irrigated	.....	.....	.....	.....	.....	.....	.....	70	.....
Lowan	Not irrigated ...	.....	.....	.....	2	.....	.....	.....	.....	.....
	Irrigated	.....	.....	.....	5	.....	.....	.....	.....	.....
Narracan	Not irrigated ...	.....	.....	.....	.....	.....	.....	.....	169	.....
	Irrigated	.....	.....	.....	.....	.....	.....	.....	120	.....
Nowham	Not irrigated ...	.....	89,974	.....	2,778	.....	.....	.....	.....	.....
	Irrigated	.....	270	.....	20	.....	.....	.....	.....	.....
Oxley	Not irrigated ...	.....	.....	.....	.....	.....	.....	.....	241	.....
	Irrigated	.....	.....	.....	.....	.....	.....	.....	1,805	.....
Strathfieldsaye ...	Not irrigated ...	.....	.....	.....	.....	47	4,218	.....	.....	.....
	Irrigated	.....	.....	.....	.....	20	26	.....	.....	.....
Swan Hill	Not irrigated ...	958,246	44,224	13,734	.....	.....	11,412	.....	.....	.....
	Irrigated	79,764	2,860	1,536	.....	.....	1,093	.....	.....	.....
Yackandandah ...	Not irrigated ...	.....	.....	.....	391	.....	.....	.....	.....	888
	Irrigated	.....	.....	.....	72	.....	.....	.....	.....	28
Total	Not irrigated ...	2,068,286	134,198	13,734	3,324	329	32,906	.....	6,763	888
	Irrigated	81,004	3,130	1,536	174	270	1,303	144	4,176	28

APPENDIX D 8.

[Extract from Reports of Board appointed to advise on the feasibility of giving a supply of water to the Northern Plains, Victoria.]

THE GUNBOWER SCHEME.

18. We append a Schedule of the works in the order of their importance, with an approximate estimate of their cost, and we include in it a list of works already carried out by the Shire Council of Swan Hill, which will fall in with the scheme, and may therefore be considered a part thereof.

Schedule of Works proposed.

	£ s. d.	£ s. d.
Enlarging and deepening the inlet to the Gunbower and head works	920 0 0	
Deepening Taylor's Creek	40 0 0	
Weir below Taylor's Creek (not required till works require renewal)	750 0 0	
		1,710 0 0
Weir on the Loddon and Sheepwash Creek and improvement of channel to lakes		1,750 0 0
Head works at inlet of Deep Creek	300 0 0	
Permanent weir at Cohuna when required	1,500 0 0	
Deepening Barr Creek and enlarging bridge	200 0 0	
		2,000 0 0
Additional channels, weirs, and tanks (paragraph 15)		2,500 0 0
Macorna channel, with channels and tanks		7,570 0 0
Engineering and contingencies		1,561 0 0
Approximate cost of works already completed and in progress by Shire Council as per list appended		1,509 0 0
Total		£18,600 0 0

Of which only £7,787 would require to be expended immediately.

The total sum of £18,600 amounts to £26 19s. 1½d. per square mile, or about 10d. per acre. The annual expense would be approximately—

	£ s. d.
Interest at 5 per cent.	930 0 0
Maintenance	500 0 0
Collection of rates, &c.	200 0 0
Total	£1,630 0 0

This amounts to rather more than ¾d. per acre of the land commanded by the scheme, including the State forest.

Works already completed and in progress by Swan Hill Shire Council which, in our opinion, should be included in the expenditure on this scheme :—

	£ s. d.
1. Loddon and Sheepwash dam, compensation to Mr. Fairlie, and small dam near Lake Charm	117 16 0
2. Gunbower dam	218 11 0
3. Cohuna dam	184 8 8
4. Thomson's dam on Barr Creek (present value)	400 0 0
5. Kerang dam, supplying township...	64 18 0
6. Wandella Lake channel	133 11 3
7. Lake Elizabeth, inlet to	350 18 9
8. Garden's station dam, Barr Creek	36 2 0
Total	£1,506 5 8

Nos.

Nos. 2, 3, and 5, although they cannot be considered permanent works, are included, because they are works of great utility, and it is not intended to supersede them by more permanent works until required. At the same time it is not recommended that any great expense should be incurred in repairing or maintaining them.

APPENDIX D 14.

Report on the Navigation of the River Darling, by G. Gordon, C.E.

To the Provisional Directors of the River Darling Navigation Co.

1. I have given my careful consideration to the subject which the Board did me the honor to refer to me for my opinion, viz., the making of the river Darling permanently navigable from Wilcannia to Wentworth.

Character of the river.

2. The river for a distance of 368 miles above Wentworth has a fall of only 92 feet, or an average of 3 inches per mile. This fall is tolerably uniform, but the regularity is somewhat disturbed at low-water by the bars of rock which occur here and there. The present condition of the river is not stable; it is in a state of constant gradual change—the banks on the hollow side of the numerous bends are increasing in their convexity. This process going on for long periods of time occasions the formation of the narrow necks between reaches of river separated by miles of distance if measured along its course, and eventually the breakage through of these necks. As the process of the lengthening of the bends by this action is counteracted by the occasional breaking through of the necks, it is probable that the length of the course of the river is not materially altered, and that its *régime* may be considered generally permanent, though locally unstable.

3. In dry seasons the river, as regards navigation, practically ceases to flow, while the great floods reach the general level of the tops of the banks; and it is chiefly with regard to these two features that the mode of treatment will have to be determined.

Data.

4. By the kindness of Mr. Moriarty, Engineer-in-Chief of Harbours and Rivers, I was allowed to have tracings made of the survey of the Darling from Wentworth upwards for a distance of 386 miles. Beyond this the survey is incomplete, and the levels are wanting; but for the purposes of a preliminary report it will be sufficient, in view of the similarity of the character of the river above and below this point, to assume the fall to be practically uniform from Wilcannia to Wentworth, a distance of 500 miles. I examined the upper portion of the river, but owing to want of depth of water I could not navigate the whole distance to Wentworth; but I examined the river at different points of its course below Menindie.

Object of improvement.

5. The ends desired to be obtained in the improvement of the river are—
   1st. Permanent navigation throughout the year, both at low-water and during floods.
   2nd. The least possible heightening of the flood-level.
   3rd. The re-establishment of natural navigation—*i.e.*, without the help of locks—at as early a stage of a flood as possible.

Modes of improvement.

6. There are five principal modes of assisting the navigation of inland rivers—
   1st. By dredging the shallows.
   2nd. By contracting the channel by longitudinal banks, so as to give greater depth over the shallows.
   3rd. By floating—that is, by impounding the water by means of a system of weirs, and opening one of them suddenly so as to produce an artificial flush, on top of which a fleet of boats can be floated down to the next weir, which would then be opened; and so on.
   4th. By impounding flood-water in large reservoirs in such quantities as will, when released, maintain a navigable depth in the river throughout the dry season.
   5th. By canalization—*i.e.*, by dividing the river into a series of level ponds, of sufficient depth for navigation, by means of weirs furnished with locks for the passage of vessels.

In the case of the Darling the first and second of these methods are inapplicable, because of the very small discharge of the river during summer,—a condition which would be aggravated by these methods, as the discharge of this small quantity would be made more rapid. The third method could only be advantageously employed on certain portions of the river, because in the very long ponds between some of the weirs the artificial fresh or wave would be apt to pass down with too great a velocity. This method also involves considerable difficulty in manœuvring the weirs. The fourth cannot be entertained, as there are no sites for large reservoirs. I therefore recommend the last-mentioned plan, viz., canalization combined with the deepening of the said channel in places, so as to be navigable by vessels drawing 6 feet of water.

Kind of works recommended.

7. Without detail surveys the exact position of the weirs and locks cannot be determined, but they would probably be nearly in the positions chosen in the accompanying diagram,* advantage being taken of the cut-offs for the location of the locks (when otherwise desirable) so as to save distance for navigator and gain length for the weirs. The weirs should offer as little obstruction as possible, so that their effect on a flood should disappear as soon as may be. I have therefore fixed the lift of the locks generally at from 4 feet to 6 feet 6 inches only, both with the object just mentioned and also in order to reduce the cost of the weirs, which would increase in a greater ratio than their height; but a few have a greater lift. The locks would be submerged during high floods. When, in consequence of a fresh, the river could be maintained at such a depth as to be navigable, a navigable pass in the weir would be opened, and the navigation would thus follow the course of the river without passing through the locks. This is the system adopted in some of the latest navigation works on the Continent of Europe and in America, and is very suitable for such a river as the Darling, where permanent weirs and locks of high lift would be inadvisable, not only on account of the great cost of high weirs that would resist the action of high floods, but also because it is undesirable to materially increase the height of the maximum floods.

Dimensions

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* The diagram is drafted on scales 20 ft. vertical and 10 miles horizontal to 1 inch. It shows the various levels of the river and position of locks from Wentworth to a point 30 miles north of Pamammaroo station, or to within 132 miles by river of Wilcannia, the length of river sectioned being 368 miles. The various heights and positions of the locks and the distances between them are as follows:—

1. Wentworth; 8 ft. lift
2. About 10 miles below Tapio station; 6 ft. lift; distance, 23 miles.
3. About 6 miles below Para; 5 ft. lift; distance, 34 miles.
4. About 7 miles above Para; 6 ft. lift; distance, 18 miles.
5. About 19 miles further up; 6 ft. lift.
6. About 19 miles further up; 6 ft. lift.
7. 7½ miles below Malara; 4 ft. lift; distance, 18 miles.
8. A mile above Pooncarie; 6 ft. 6 in. lift; distance, 15 miles.
9. 17½ miles up; 6 ft. 6 in. lift.
10. About 2½ miles below Moorara; 4 ft. 6 in. lift; distance, 22½ miles.
11. 24 miles up; 6 ft. 6 in. lift.
12. 29 miles up; 4 ft. lift.
13. 17½ miles up; 6 ft. 6 in. lift.
14. 16 miles up; 4 ft. 6 in. lift.
15. 19½ miles up; 5 ft. lift.
16. 15 miles below Menindie; 5 ft. lift; distance, 14 miles.
17. 29 miles above Menindie; 6 ft. lift; distance, 44 miles.

Dimensions of locks.

8. The dimensions I propose for the locks are: length, not less than 200 feet; width, 18 feet; depth on sills, 6 feet inches; lift, 4 feet to 6 feet 6 inches. When a lock could be placed in a cut off, the length might be considerably increased, without materially adding to the cost. The lock-chamber should be of sufficient area to take one or more barges as well as the towing steamer, which should also be a cargo boat. The width of the navigable pass should not be less than 50 feet, and it would be opened as soon as the discharge was sufficient to maintain a depth of 6 ft. 6 in. through it. As the navigable pass would occupy about half the width of the river, and as it would always be full open during floods, the effect of the fixed portion of the weir on a high flood would be almost imperceptible. For instance, with a 15-foot flood in the river, the fall in the surface of the water in passing over the weir would be only 3½ inches.

Conserving water.

9. From my observations of the flow of the river at the time of inspection, I believe that the summer supply will at all times be sufficient to compensate for the loss by lockage and evaporation; but as by means of the weirs the anabranches and the lakes and lagoons situated back from the river could be more readily filled, and as the water could, by means of flood-gates and sluices, be retained in them until it was required, an abundance of water could, even in the driest years, be made a certainty, while the supply to the back country would be very greatly improved. Although it does not come within the scope of the inquiry submitted to me, I may be permitted to bring under the notice of the Board the importance of the subject of water supply, which I have reason to believe could be economically and profitably combined with the navigation project. In the near future, no doubt, irrigation also will have to be undertaken to some extent, but at present the value of an abundant supply of water for stock is alone of great consequence.

10. Inland navigation, after having for some time been almost at a standstill, owing to the rapid extension of the railways, has of late years experienced a revival both in England and more especially on the Continent, its numerous advantages, more particularly the low cost of haulage and of maintenance, enabling it to contrast favourably with railway traffic. When a river is canalized and the navigation is independent of floods and drought, the one great advantage of railway communication —its regularity—disappears, while the carrying capacity of a canal is much greater. The total cost of carriage on a canal or navigable river decreases in a far greater ratio with the increase of traffic than does that by railway. In the *Contemporary Review* for April last General Hamley writes—"Fifteen years ago it would scarcely have been disputed that canals must give way to railways. The teaching of to-day is, however, quite different. There is a widespread belief that inland water carriage may compete successfully with railways, and a very general desire to bring the former mode of transit into more extensive use." It has, in fact, been found advisable, even where railway communication already exists, to construct lines of navigation, or to improve rivers, at a cost of from £7,000 to £11,500 per mile.

Estimate of cost.

11. The following is my estimate of the cost of the works above proposed:—

Locks with weirs and navigable passes, twenty-one at £10,000, and one at £20,000	£230,000
Deepening shallows	30,500
Clearing banks of trees and snagging	6,500
Works to billabongs, back-waters, &c.	6,500
Wharves, cranes, &c.	6,000
Contingencies and engineering	30,500
	£310,000

The annual expense may, I think, be stated as follows, exclusive of interest on capital:—

Lock-keepers, twenty-two at £125	£2,750
Repairs and maintenance	3,000
Management	1,500
	£7,250

12. By the above-described system of lockage, all the steamers now navigating these rivers except six sternwheel steamers would be excluded from the navigation in the low states of the rivers, as they are at present, but thirty of the barges, with a gross tonnage of 1,712 tons, could pass through the locks. By means of the navigable passes all the vessels now navigating the river, drawing 6 ft., could continue to do so when there was an 8-ft. fresh in the river.

13. By reducing the depth so that only vessels drawing not more than 4 ft. could navigate the locks, I think the cost could be reduced by about £40,000. To increase the navigable depth in the river and locks would require a much greater proportionate increase in the cost. I do not think the locks should have a greater width than 18 feet. The navigable depth to be adopted should, however, be regulated in connection with possible improvements in the Murray, but I do not think it should exceed 6 feet. Similar dimensions of locks to those recommended are found equal to a traffic of 1,000,000 tons per annum.

Melbourne, June 5, 1883. G. GORDON.

APPENDIX D 15.

RIVER DARLING.

PROBABLE Cost of a Timber Weir to raise the water for the purpose of diverting it to the back country.

Probable cost of Weir only	£9,500
If the navigation had to be provided for, the *extra* cost of cutting a Canal, with a flight of Locks at its lower end, in a favourable position, above the estimated cost of the single Locks that would otherwise suffice for the navigation, would probably be	2,000
	£11,500

G. GORDON.

LOCKS ON THE DARLING.

My estimate of the cost of a Lock on the river Darling, 200 feet long, 18 feet wide, depth 6 feet 6 inches on the sills, with a lift of 6 feet, constructed of concrete and masonry, was £8,000.

The cost of Weirs for navigation only, corresponding in height to the above Lock, and built in 3 feet of water, so that the crest would be 9 feet above the bed of the river, was estimated as follows:—

1. Concrete and stone on rocky bed	£17 10 0
2. Timber Weir on sandy bed	15 0 0
3. Do do clay do	11 10 0

All per lineal ft. of fixed Weir, and the average was taken at £14 4s., No. 2 being the most usual case.

The movable part, 50 feet wide (Poirée's Needle Weir), was taken at £20 per lineal foot.

The length of the two parts would generally be over 100 feet.

To the above has to be added £350 for abutments and wing walls.

G. GORDON.

APPENDIX D 17.

APPENDIX D 17.

LOWAN SHIRE WELLS.

THE depth of the Wells varies from 129 feet to 196 feet to the water, the average being 161 feet.
The cost of dry sinking, 25s. to 28s per foot (double shaft timbered).
Cost of wet sinking in chamber at bottom, £3 to £10 per foot; average, £6.
Average cost of windmill pump, iron tank, and troughs, &c., £250.

G. GORDON.

APPENDIX D 18.

Cost of Impounding Water in large Reservoirs in Victoria.

	Name of Reservoir.	Capacity in cubic feet million.	Cost of Work, including Outlet Works and Compensation for Land.	Cost of Storage per million cubic feet.	Remarks.
			£	£ s. d.	
1	Warranga Basin	3,690	62,270	17 5 11	To be fed by an artificial channel estimate—not constructed.
2	Yan Yean	1,024	150,000	146 9 8	
3	Malmsbury	465·4	100,375	215 14 0	
4	Barker's Creek	100·7	34,017	337 18 4	
5	Spring Gully	40	12,443	311 1 10	
6	Stony Creek	152	50,548	332 8 6	
7	Average of 6			223 18 7	

APPENDIX E 2.

Mr. J. Gregson to The Government Astronomer.

Sir, Newcastle, 16 December, 1879.

I venture to take the liberty of writing to you in reference to the subject of your letter of 10th inst., published in Saturday's *Herald*, for the purpose of mentioning that considerable tracts of country adjacent to the main Dividing Range are watered by springs whose sources, like those of the Darling River wells, must be distant.

A spur of the main range divides the waters of the Comet and Negoa Rivers in Queensland, the line of the watershed having an average course of about north and south, in longitude 148°. The formation is porphyritic, the western slopes being of basalt, the eastern decomposed sandstone and conglomerate. The ridge attains a height of 500 feet above the surrounding country, which itself lies about 1,500 feet above sea-level. The main range, or that portion of it called Buckland's Tableland, lies 40–60 miles to the south, the summits here being fully 2,500 feet above sea-level. The western slopes of the spur I speak of are drained by watercourses in which are streams running all the year through. These streams start from springs, and are often a mile or more in length before the water disappears underground.

I resided in this district for years, and have often amused myself with estimating the quantity of water which flows from this ridge, satisfying myself that, as its volume was vastly more than could be supplied by rainfall thereabouts, the water could only come from a distant source, which I suppose to be the interior of the continent.

Much the same thing is to be seen about the Liverpool Range, in the neighbourhood of Cassilis. There are on the south side of this part of the range the Munmurra, the Krué, the Wybong, the Dartbrook, and the Page, all tributaries of the Hunter, which have in all seasons streams of water (though in dry times the water is only found in the gravel-bed), and I am much mistaken if more water does not pass along these streams and in those on the opposite side of the range than is supplied by the rainfall on the neighbouring high ground. As in the instance above mentioned, it has often struck me that the water has found its way from the great plains of the interior.

The fact you mention, that from wells between Wilcannia and Bourke the water has risen to a height of 26 feet above the surface of the ground, seems to me to corroborate the idea. Would it be a very wild stretch of the imagination to suppose that the plains of the interior lie like a crust upon the surface of an immense lake, rising with the supply of water in flood-time from such rivers as the Barcoo and Thomson in Queensland, and the more southern Darling River, and falling as this supply is gradually exhausted by such outlets as those I mention?

However this may be, it would be an interesting speculation as well as a useful one to inquire where the water does come from, and I hope your communication to the *Herald* may have come under the notice of some whose attention being turned to the point may be able to throw some light upon it.

I remain, &c.,
JESSE GREGSON.

APPENDIX E 3.

[*Extract from Minutes of Proceedings of Intercolonial Meteorological Conference, held at Melbourne*, 1881.]

EVAPORATION.

Mr. H. C. Russell reported that, having for the past ten years carried on observations with three forms of evaporators, he thought the condensed results might be of interest to the members of the Conference. He mentioned that observations with the glass evaporator were begun at Sydney Observatory in 1860, but it was not until 1871 that the other two forms were placed beside it for the purpose of comparison. It was simply because the glass instrument was the one in use that it was assumed to be the standard for comparison, and not for any advantage in form or substance which it might be supposed to possess. The tin one had been adopted for use in the country because its cost was little, and the large one was started because it seemed to put the water into the condition which obtains in an ordinary open reservoir. The following details will form a sufficient description of these instruments:—

No. 1.—A glass vessel, standing on the ground, 8 in. high and 8 in. in diameter, in which the water is usually about 6 in. deep; it is read by a vernier scale attached to a point which is every morning made to touch the water by screw motion.

No. 2.—A tin vessel, painted white, standing on the ground, 12 in. high and 8 in. in diameter, in which the water is usually about 8 in. deep; the amount of evaporation is ascertained by weighing it every morning.

No. 3 is a galvanized iron vessel, sunk into the ground 2 ft. 4 in.; it is 2 ft. 6 in. deep, and 4 ft. in diameter. In it is a small float, to the top of which is attached a light vertical rod passing through two guides; this is graduated to tenths of an inch, and read to $\frac{1}{1000}$ of an inch by means of a microscope fixed on a firm support. The edge of the vessel is only 2 in. above the ground, to prevent surface water from running into it; and the grass is allowed to grow level with the top, to prevent rain splashing in, and sun-heat on the metal outside.

The table herewith shows the result from each evaporator, together with temperature, humidity, wind, and rainfall, for ten years, 1871 to 1880. It will be observed that the tin one shows the greatest amount, the glass second, and the large one least, on the average for ten years; but it is worth noting that in 1876, when the velocity of wind greatly exceeded other years, the tin one gave the evaporation only 7 per cent. above the average, the large one 20, and the glass 28 per cent.

Observations on the temperature of the water in the evaporators show that the glass one is most affected by the sun, the tin next, and the large one least.

In the course of the experiments the question arose whether more or less evaporation took place during the day as compared with the night. The day was divided at 9 a.m. and 9 p.m., and the observations confined to the glass and large evaporators; and it was found that the glass one gave 42 per cent. more during the day than during the night, and the large one 18 per cent. more during day than night, and it sometimes happened that it was more during the night than during the day. The result of these observations may be expressed in another way: Comparing the two, the large one gave 13 per cent. less than the glass one during the day, and 23 per cent. *more* during the night, which seems to prove that the heat absorbed by the large one during the day was given off in vapour during the night, and not by radiation from the sides, as in the glass one.

Year.	Shade Temp.	Humidity.	Miles of Wind.	Total Rainfall.	Evaporators.					Large greater than Glass.
					Amount in Tin.	Tin greater than Glass.	Amount in Glass.	Large less than Glass.	Amount in Large.	
1871	62·4	74·9	96·821	52·147	65·756	22·785	42·971	9·643	33·130	In May and June Large greato than Glass.
1872	62·6	75·9	98·830	37·001	66·589	25·001	41·588	11·495	30·093	Greater in May.
1873	63·0	75·9	91·306	73·263	54·622	6·761	47·861	18·427	29·432	
1874	63·0	75·6	97·651	63·478	59·622	8·682	50·940	18·934	32·006	
1875	63·4	73·2	96·003	46·209	59·243	0·607	58·636	22·521	36·115	
1876	63·6	74·2	103·373	45·647	59·790	—3·692	63·482	24·699	38·783	
1877	63·8	74·6	95·087	59·517	49·599	—5·567	54·166	22·544	31·622	
1878	63·6	73·5	97·945	49·617	50·355	—3·733	54·088	21·404	32·684	
1879	62·1	75·1	99·061	63·193	43·785	4·887	38·898	10·081	28·817	In May greater than Glass.
1880	62·8	73·2	91·112	29·513	47·556	7·350	40·206	8·690	31·516	In May greater than Glass.
Means	63·0	74·6	96·719	51·959	55·692	6·409	49·283	16·863	32·420	

Another question presented itself, and was answered by several months' observation. It was—What ratio does evaporation in the shade bear to that in the sun? The shade chosen was the thermometer-shed, where the air has free access, but there is complete protection from the sun. The mean result of the measures was that 26 per cent. less evaporation took place in the shed than in the glass evaporator in the sun; or, comparing it with the large one, the result in shade was 9 per cent. more than in the large one; but, as the shade evaporator was placed 3 feet above the ground, where the air would probably be drier than on the surface of the ground, where it affects the large evaporator, it is probable that a small evaporator in the shade would give about the same result as one 4 feet over and sunk into the ground.

It will appear from what has been said that every change of condition under which evaporation is measured produces a change in the result, and since the conditions are infinitely variable, so the results must be. Therefore, before any comparable results can be obtained, we must determine what it is that we want to measure. Is it the evaporation from water in the ground, from water in a glass or metal vessel on the ground, or from water at some distance above the ground? For the mere purpose of comparison, any one of these positions would do, but since the one in the ground comes nearest to the condition of a natural reservoir, I prefer it, because the results would be directly useful for a practical purpose, as well as for science.

APPENDIX G 1.

FRIDAY, 14 *DECEMBER*, 1866.

Present:—

MR. FORSTER, MR. HAY, | MR. MATE, MR. PHELPS.

THE REV. J. D. LANG, D.D., IN THE CHAIR.

William Christopher Bennett, Esq., M.I.C.E., called in and examined:—

309. *Chairman.*] What is your designation? I am Commissioner and Engineer for Roads.
310. I understand you have resided for some time in the Riverina District? That is a mistake; I have been there on duty.
311. You are acquainted with the country generally? I am acquainted with the country generally; my duties take me all over it; I have been up there recently; about three weeks ago I was at Albury.
312. Are you acquainted with the character of the country between Deniliquin and Echuca on the Murray River? Yes.
313. What is the distance between those two points? It is somewhere about 50 miles, more or less.
314. What is the character of the intervening country, as likely to be applied to any agricultural purposes? All that country is suited for agricultural purposes, provided it be irrigated—perhaps the finest agricultural country in the world—but it would require to be irrigated on a large scale, as is done in India, to make certain of crops.
315. Would it be practicable to have irrigation from the distance to any water supply? It is a matter I have been employed upon in my early days, and have given a great deal of attention to the subject. The similarity of the country between the Jumna and the Ganges, and of that between the Murray and the Murrumbidgee, is remarkable indeed.
316. Do you think the value of the land, as being likely to be made available for agriculture, is at present an element of sufficient importance to take into account, in contemplating the construction of a railway—would any considerable amount of revenue be derived from the sale or from the use of the land for agricultural purposes? I have no doubt that large quantities of land would be sold, but I am doubtful as to the permanent success of agriculture there unaided by irrigation; it would be uncertain.
317. You do not think that that element of inquiry is of sufficient importance to be taken into account, in considering the ways and means for the construction of a line of railway? Not the agricultural element alone. Unaided by irrigation, think the country more suited for pastoral than for agricultural purposes.

318. Are you aware of the probable cost of a line of railway along that country? I could not give you a strictly professional opinion upon that, because I have not surveyed it, but I could give a surmise. I should think the cost of a railway ought not to exceed £6,000 a mile there; and when I say that, I mean a first-class permanent way—and I could not recommend any other—with moderately cheap stations.
319. What do you think are the necessities of the case that induce the parties interested to move for the construction of a railway;—is it necessary under present circumstances for that tract of country? There is a very great trade there.
320. And is that trade increasing? Yes; but I should be allowed to qualify this answer, by stating that I think the making a railway there would be a very suicidal act on the part of New South Wales. Already the traffic goes to Melbourne more than one interested in the prosperity of New South Wales desires.
321. Do you think we can help that, in the ordinary course of events? Yes, by concentrating all the resources of the Colony in making a railway to Wagga Wagga, with the ultimate prospect of a branch to Deniliquin.
322. Do you not think that the tendency of the commerce—of the traffic—in that part of the country, is towards the Murray River? Yes.
323. The natural tendency? The tendency is so, but I can hardly apply the word "natural" to it, because the course of commerce will go through the arteries provided for it. I think the tendency of the commerce to Melbourne is owing to the apathy of the Sydney community, who do not sufficiently know the value of that country.
324. Do you think this tendency could be easily counteracted by the Government of the Colony of New South Wales? If the Legislature were as firmly convinced as I am of the value of that country to New South Wales, I am sure it could.
325. You are not favourable, therefore, to the construction of a railway through that line of country? No, not until it is connected with Sydney.
326. You are not aware of the amount of traffic at present on the line? It is very great.
327. *Mr. Phelps.*] Do you consider that if a railway were made from Wagga Wagga to Deniliquin, and Wagga Wagga were connected with Sydney, that the trade would come to Sydney? Yes, because of the break of gauge. If you had goods to send away to port from Deniliquin, you would not send them on the railway to Echuca, to have them there transshipped to Melbourne. At the time of the battle of the gauges in England, it was considered that a change of gauge was equal to an additional distance of 50 miles; so that this would be practically moving Deniliquin 50 miles nearer Sydney.
328. Do you think it would be done more cheaply than carrying wool by dray from Deniliquin to Echuca? The carriage to Sydney?
329. Yes? That would depend upon the traffic arrangements on the Sydney Railway. It might be to the interest of the Sydney Government to carry wool from Deniliquin to Sydney cheaper than from Wagga Wagga to Sydney, to induce the traffic. Such things occur in England. In some places goods are carried at a cheaper rate for longer distances than for shorter, from points where opposition is likely to arise.
330. You would not think it advisable, supposing this railway were made from Deniliquin to Echuca, to have it on the Victorian gauge? Most decidedly not; it would practically be handing the country over to Victoria, as not only would it extend the radius of Melbourne influence 50 miles further ——
331. *Chairman.*] Is there not an Act of Parliament limiting the extent of the gauge in this Colony to all railways constructed within it? Yes; but if a special Act were passed for Deniliquin it would override that.
332. That is the state of the law at present? Yes. Then there is another question of some importance with reference to the gauges. In England, where two gauges are laid down, on account of the great difference in them there is very little difficulty in laying down a third rail; but here the gauges are so close that I think it would be attended with some difficulty and inconvenience; so that, practically, if a broad gauge were laid down to Deniliquin, when our line came there, it would be necessary to take up the broad gauge and put down the narrow.
333. *Mr. Phelps.*] You mentioned, some time ago, that you qualified your answer by saying that it would be a disadvantage to New South Wales to allow the traffic of the country to go to Victoria; but supposing this country cannot be developed unless this traffic and produce go to Victoria, would you under those circumstances still object to the railway? But I cannot admit the possibility of that supposition—I think the country can be developed; it is a point I have given great attention to during the time I have been in that part of the country.
334. New South Wales might lay out two millions to connect it with Sydney, when £200,000 would connect it with Melbourne? Yes, but New South Wales might lose a much larger sum than two millions by avoiding that expenditure.
335. In what way do you think New South Wales would lose it? In the countless ways by which traffic makes money; in revenue, in profit on sales, on imports in Sydney. The making of this railway would be practically handing over the country to Victoria, and it would be better to hand it over *de facto* than nominally to hold it while the real benefit of occupation was derived by Victoria.
336. Would you then assume that the interests of the people in that part of the country are to be neglected, in consequence of the difference of interest of Melbourne and Sydney? No, but I speak in the interests of the larger population of New South Wales; and I think in this case, as in all others, the rule must be applied that the interests of the minority must yield to those of the majority.
337. Then you think that this difference of gauge creating an obstruction between New South Wales and Victoria is rather a benefit to New South Wales? Until the railway system is thoroughly developed, I do; it will be an inconvenience then.
338. *Mr. Forster.*] Have you any interest in this railway? None whatever. I am a Government official.
339. Do you think this will be a paying railway? From Deniliquin to Echuca?
340. Yes? Yes, I do; it will pay well, but it will cause the Colony much greater loss in another way.
341. I mean the undertaking as a matter of investment for capital—the undertaking itself. Supposing what is now proposed were carried out, do you think it would be a profitable undertaking to the shareholders? Yes.
342. Then, in fact, you suppose that this Company would get on without any Government assistance? I have not read the prospectus of the Company, but I have a general idea that the project will be a remunerative one.
343. Then it would not require Government help. You say it would be a profitable undertaking;—do you think it would be so without Government help? Yes.
344. That is, so far as the profit of the undertaking is concerned, you do not think the promoters would require to be assisted by a subsidy? Decidedly not.
345. Do you think it would be for the interest of the Colony to subsidize the line, from other points of view? No, I think it would be to the interest of New South Wales to make it on the New South Wales gauge, so that we might ultimately work it.
346. You say that it would be a great loss to New South Wales in other respects, I suppose by the withdrawal of traffic? Yes, by extending the influence Melbourne has over the southern part of New South Wales, which is too great already.
347. I presume this loss would arise from the private interests of individuals directing them to avail themselves of a better line of traffic than they have at present? Yes.
348. It would be simply private interests directed in another channel? Yes.
348½. Do you think this railway would be injurious to the district? No, railways must be a benefit to any district.
349. Would it be a particular benefit to those whose traffic naturally flows either to Melbourne or down the Murray? Yes, but I cannot admit that word "naturally." The traffic will flow in the arteries that are made for it, and a railway is not the *natural* course of a traffic, as that is an *artificial* work.
350. When I speak of "naturally," I do not allude to these artificial lines of communication at all; but taking a new line of country, where no road is made at all, we find the settlers send their wool and receive their stores, some by one line of traffic and some by another; in some cases traffic without any artificial road would come to Sydney, in others to Melbourne—that is what I mean by natural. If you make a better road, you will make a difference in the line of traffic. In that sense, may it not be that those localities whose natural connection in the way of traffic would be with Melbourne would be benefited by this railway? Yes, they would be benefited by it.
351. *Mr. Hay.*] You have spoken of the possibility of developing this district by irrigation? Yes.
352. And have given strong opinions with regard to its capability. Have you examined the character of the country in a geological point of view? Not in a geological point of view. I have looked at the surface soil, and seen what it produces near Albury, and as far as Corowa, and I never saw finer.
353. Do you think there is any resemblance in the character of the country at Albury and Corowa, and that which lies lower down the Murray and Murrumbidgee? The country changes in its character—the soil is lighter.
354. Have you passed from Deniliquin to Hay? No.
355. Because you spoke of the character of the whole of the country? That was as to general configuration with reference to the river.

356. You spoke of the whole of the country between the Murray and the Murrumbidgee as being similar in its character to the country between the Jumna and the Ganges? I spoke as to its physical character—not as to its soil.
357. As to its configuration on the map? Yes.
358. You have not examined the country? No, not the soils.
359. You have passed over the country between Echuca and Deniliquin? Yes, and between Albury and Deniliquin.
360. Not to the north or west, or directly to the east of Deniliquin? No.
361. Have you examined the line between Echuca and Deniliquin? No.
362. You are not aware of the geological character or nature of the soil there? No, except that I understand that it is something like the soil in the vicinity of Deniliquin.
363. In what season of the year have you visited it? I have been there three or four times—I could not tell exactly the season of the year.
364. *Mr. Phelps.*] Was the country dry or green? It was dry at one time, and at one time tolerably green.
365. *Mr. Hay.*] You have not examined it with a view to the effect of the season? No, except that I saw it suffer very severely from drought.
366. When you say you have paid a great deal of attention to the subject of irrigation, do you mean irrigation in the English sense, where running water is led over pastoral lands, for instance; or in the Indian sense, where whole fields are submerged? In the Indian sense. I have been studying lately what has been done there in the way of irrigation.
367. In that particular kind of irrigation you allude to, it is necessary from time to time, and for a considerable period of time, to submerge the whole of the cultivated lands, is it not? Yes, partially to submerge them.
368. What do you mean by partially submerging them? Not to entirely cover them, but to let the water flow over the surface, not to cover them for any great depth.
369. To cover the land for a few inches, so as to saturate the soil? Yes.
370. I think the land you have referred to is approaching to a flat? Yes.
371. Have you ever made any calculation as to the quantity of water necessary to saturate soil of that description? I have not gone closely into that.
372. I suppose you have studied the subject enough to know, however, that it would take a large quantity of water indeed? Yes. In my earlier experience I had very much to do with works of that character—drainage and navigation, and dealing with large quantities of water.
373. Have you ever made any calculation as to the quantity of water in average seasons which could be supplied by the Murray? At the Murrumbidgee I have had the minimum quantity of water taken; at the Murray I have not been able to get the exact minimum; but the quantity in the Murrumbidgee is one-tenth the quantity taken out of the Ganges, at Hurdwar.
374. What do you mean by the minimum? At the very lowest state of the river I have had the discharge measured at Gundagai.
375. At what particular season? Last season, when it was very low—lower than it had been for many years.
376. Did you ever ascertain what had been the lowest quantity of water known in the Murrumbidgee at Gundagai? I believe it was the lowest, when measured, that it had been known for many years.
377. Do you know the Tumut River? Yes.
378. It is not a very large river? No.
379. Do you know the Murrumbidgee a little above the Tumut? Yes.
380. Do you know that the Murrumbidgee immediately above the Tumut has been known to stop running altogether? On the surface?—I did not know that, but it may have done so on the surface, and yet there may have been a considerable flow beneath. Last year it was stated to be very low indeed.
381. Did you ever hear it stated that the Murray and Murrumbidgee, at Gundagai, have been fordable by a man on horseback for a whole year? No; but even if they were fordable on horseback, there would still be a considerable quantity of water flowing on.
382. I suppose, from the study you have given to the subject, you would be of opinion that the capability of this region would depend upon the character of the soil partly, and partly upon the supply of water which was available to flood these large quantities of land? Yes.
383. Suppose that this region were capable of such development, have you ever made any calculations as to the difference which would be made by compelling the whole of its traffic to be conducted with Sydney in the place of Melbourne, from the increased distance? No.
384. Have you ever made any calculation as to the expense of making a railway from Goulburn, say to Hay, as about the nearest place to Sydney, that would tap that district? Not to Hay; my knowledge of the country is more between Goulburn and Wagga Wagga. I suppose the country is very much the same—it is a mere matter of length.
385. There is a great deal of mountainous country between Goulburn and Wagga Wagga? Yes.
386. Have you formed an opinion of the expense of a railway from Goulburn to Wagga Wagga? My opinion in railway matters is not of much worth, because my experience in railway making is not great, but I should think the country between Goulburn and Wagga Wagga is not more difficult than, if so difficult as, the country between Goornong and Albury on the Victoria side, which is estimated at £6,000 a mile.
387. That is all a flat country between Albury and Goornong? Yes; but to Beechworth, that is not flat. That is estimated to cost £6,000 and £1,000 for rolling stock, and £1,000 for stations, sidings, &c.
388. Did you ever ask Mr. Whitton what would be the expense of a railway from Goulburn to Wagga Wagga? No.
389. He has had a survey there? They were very preliminary lines.
390. Are you not aware that the surveys between Goulburn and beyond Yass showed very great difficulty indeed in the formation of a railway? No, I am not aware of it—I think that report must have been made some years ago, before they were able to make railways up such steep gradients.
391. Taking into account the gradients upon the Sydney and Goulburn line of railway, do you think the expense of the traffic conducted as between Goulburn and Sydney would be greater or less than that between Echuca and Melbourne—the distance between Echuca and Melbourne being a little longer, would the expense on the whole be greater or less? They have a much larger interest upon capital to pay in Victoria.
392. I am taking it independently of that—as to the expense of haulage? The haulage would be cheaper on the Victorian line.
393. Wagga Wagga being about the nearest point to Sydney in this district, and Echuca the nearest point to Melbourne, and the expense of transmitting goods from Echuca to Melbourne and from Goulburn to Sydney being about equal, there would then, I take it, in order to bring goods from Riverina to Sydney, be the expense of transmission from Wagga Wagga to Goulburn over and above the expense of taking them from Echuca to Melbourne, supposing the railway were completed? Minus the 50 miles which the difference of gauge would give you.
394. I am not talking of that at all, but taking simply the question of the transmission of goods from these districts. By allowing the people in these districts to make their own railway, it would be thus much cheaper to send their produce to England? Yes, provided you allowed the Victorian gauge into New South Wales.
395. So that, by compelling this district to avail itself of railway communication to Sydney instead of railway communication to Melbourne, it would be taxing to that extent, at least, the district? Yes, always provided no allowance were made in the cost of carriage on account of the peculiar circumstances of the case.
396. It would be an absolute loss? Yes.
397. Do you think there is any particular advantage to Australia, or to the world in general, equivalent to that in retaining this district in connection with Sydney, instead of allowing it to be connected with Melbourne if it likes? I have looked solely to the advantage of New South Wales; I have not considered it in so broad a light as that.
398. You have said that you thought this railway might pay as a private speculation; but do you think it would be desirable, supposing the district were separate entirely from either Sydney or Melbourne, and had its own choice—do you think it would tend so much to the development of that district to make a railway from Deniliquin to Echuca, that it would be worth the while of the district to give a subsidy for the construction of that railway? Yes, I think it would then.
399. Do not you think it would be a long time for this district to wait till a railway was made from Sydney even to Wagga Wagga? No, not if the railway were taken up in the spirit it ought to be.
400. Supposing we went on with it at anything like the same rate we have been going on with railway construction in New South Wales for the last ten years? In that case it would be a very long while.
401. In the meantime the development of this district would have to wait? Yes.
402. By adopting the Melbourne line the railway might go on from the present time? Yes, but it would practically be handing over the country to Victoria, and extending the radius of Victorian influence over New South Wales. 403.

403. Supposing the railway were made from Sydney to Deniliquin, and that the present railway were open from Echuca to Melbourne, would it be possible even then to bring the traffic to Sydney, if the inhabitants of the district were left at liberty to avail themselves of the railway from Echuca to Melbourne? It would be a work of time.
404. Do not you think it would be necessary either to prevent their making the railway from Deniliquin to Echuca, or to prevent them getting their goods from Melbourne altogether? I do not think these things could be for a moment thought of, and I do not think the making of a railway would bring all the traffic to Sydney at once.
405. Why should the people in the intermediate district prefer sending to Sydney to sending to Melbourne? On accoun' of the break of the gauge.
406. Is there any necessity for being any break of guage? I have always presumed that the New South Wales Government would not allow the Victorian gauge into our territory.
407. Do you not suppose that a private Company might form a railway with any gauge? It would be practically handing the country over to Victoria to allow the Victorian gauge in this Colony; it would be better to make over the country at once, and get a subsidy from Victoria, to be applied to the extension of our Southern Railway.
408. Or otherwise, to prevent a private Company, with the same gauge, to lay down a railway? Yes.
409. Do not you think, in the interests of New South Wales, you might go a little further—might it not be desirable, in the interests of New South Wales, to make a wall, or some perfect means of preventing any communication with Victoria whatever? No.
410. *Chairman.*] Do you think if such a system were established in these Colonies as exists under the German Custom-house, the Deutsches-Bund or Zollverein, so as to equalize the revenue from the Custom-house among all the Colonies according to their respective amounts of population, leaving the inhabitants of the different Colonies to find their way to the most accessible ports—do you think there could be any difficulty in managing such a system, or any loss to any particular Colony? My opinion on that subject must be taken for what it is worth, for it is a matter I have no knowledge of. I should think there would be no difficulty in adjusting the mere revenue, but I do not look to that so much as to the profit derivable from traffic.
411. Do you think any Government in this Colony could afford to carry goods from Deniliquin to Sydney by a railway, supposing such to be constructed, so as to compete with the shorter line to Melbourne? Yes, I think it would pay them to carry without any profit at all, on that particular portion, on account of the collateral benefits arising from it.
412. To carry goods free? Not free, but at the same rate as they would from Wagga Wagga, beyond the influence of Victoria.
413. *Mr. Phelps.*] What line do you think the railway will be most likely to pursue that will first join Sydney with Melbourne? The southern line.
414. To Wagga Wagga? Well, that I should wish to give a qualified answer to, for I have not a sufficiently intimate knowledge of the country to enable me to speak positively; but some point near Wagga Wagga, to facilitate the extension to Albury, because that is without exception the richest country in New South Wales.
415. Do you think it would be advisable to have the land reserved and surveyed before it is alienated? My impression on that subject is, that the Government ought to have the line surveyed at once from Goulburn, and also from Deniliquin, and also all the unalienated lands on either side, and to send some highly important person home—some person of the very highest standing in the Colony—to put the matter in the English market, and negotiate either for the transfer of the land or to give a guarantee. At all costs, however, the line to Wagga Wagga should be surveyed and made. This is not an idea which has been formed within the last month or two, but it has been gradually growing stronger and stronger in my mind for the last three or four years. Year by year I see the Melbourne influence creeping up, and Sydney being entirely isolated.
416. I wish to ask you some questions with respect to irrigation. Have you been in that country in India you have spoken of? No.
417. Over what areas do you think you could extend irrigation? The area embraced by the Ganges Canal is very near as large as that between the Murray and the Murrumbidgee. If the Committee wish any further information on this subject I should wish to prepare myself and give more definite information.
418. That would be an area, I suppose, of several thousand square miles? I should think the Ganges Canal must be 30,000 square miles.
419. Have you any idea of the extent that had to be artificially levelled? No; the greater part of the country between the Ganges and the Jumna is naturally level.
420. *Chairman.*] Is there not a great difference between that portion of India and these Colonies generally, in regard to the supply of water in each? The supply is larger in India. I have ascertained that there is ten times as much water taken out of the Ganges at Hurdwar as from the Murrumbidgee at Gundagai.
421. Do you think if our rivers are occasionally as low as Mr. Hay has stated, in the southern portions of the territory, these rivers would in ordinary seasons afford a sufficient amount of water to maintain the process of irrigation on an extensive scale? I think by properly constructed reservoirage, such a thing might be done. I wish to correct one statement in the petition before the Committee. It is stated that the sum of £618,000 has been expended on the Great Southern Road. Now, the amount expended since the first commencement of the Road Department in 1857, when the road was almost in a state of nature, to 31st March, 1865, is £219,000; and since that, £31,000; so that the amount to this day is £250,000 instead of £618,000.

APPENDIX G 2.

Statement by Mr. G. Mair, of Groongal, Murrumbidgee River.

Some years ago I ploughed up about 10 acres near a lagoon on this station and sowed a portion in lucerne, a portion in prairie grass, a portion in maize, and a portion in oats.

The soil, although rich enough, is rather stiff and clayey, and it was very imperfectly broken up when the seeds were sown; the consequence being that the crops came up very unevenly, but all the plants that did come up grew very luxuriantly.

I irrigated the patch by pumping the water by means of a 12-inch centrifugal pump, and a 12-horse power engine from the lagoon into a raised channel carried round the higher side of the land; from which channel the water was allowed to overflow, by making breaches at intervals in the bank, spreading itself about until all the land was saturated. The ground is almost a dead level, so that there was little difficulty in distributing the water over the surface.

I watered it about five times during the summer months, giving it on each occasion a soaking which I should think equal to 2 inches of rain or thereabouts.

The maize crop grew well to a height of 8 or 10 feet, and the cobs of corn were of good size, but I kept no record of the quantity gathered. The lucerne and prairie grass were fed down with sheep, and the oat crop, a very fine one, was cut down for hay. The lucerne is still growing, and thrives well. The prairie grass died out last summer, when I did not irrigate it.

The primary object of my experiment was attained in satisfying me that crops of all ordinary kinds suited to the climate can be grown in great abundance in this district by means of irrigation, but I could not pretend to give anything like an accurate estimate of the cost per acre of laying down and watering, or to speak with anything like authority as to the profitableness or otherwise of the work.

I am inclined to think that ordinary agricultural products of a compact and easily transportable kind, such as flour, would be more cheaply purchased elsewhere, and brought down by rail, than grown here under irrigation, but that irrigation might be profitably used for producing hay, which is bulky, and consequently expensive of carriage; or for raising potatoes or roots which are perishable, or green stuff to feed valuable stock on in time of drought.

I think also that wine-growing might be profitably carried on under irrigation, as vines thrive very vigorously here when liberally watered, and produce grapes of great richness and flavour.

One thing I may mention which may appear somewhat incredible to people who have seen the Murrumbidgee River only in time of flood, viz., that I think the supply of water in the summer-time would sometimes be found inadequate to very extensive irrigating operations.

The stream is frequently, from January to March, so shallow that a horse may ford it without wetting his knees, and

and of no great width; and from the quantity of water I have myself pumped up with one engine and pump for irrigating and sheepwashing purposes, I feel sure that if 500 or 1,000 other people were each withdrawing a similar quantity of water from the river, the stream would be found insufficient.

This drawback could of course be obviated by the construction of weirs to impound large quantities of water in the channel and prevent it from running to waste; but this work would probably be found too expensive to be undertaken until the country becomes very much more thickly peopled than it is likely to be for many years yet.

APPENDIX H.

Water Conservation, &c.

Paper read by John Wright, Esq:, before the Engineering Association of New South Wales, 23rd March, 1882.

The very protracted drought which I regret to say still continues in many parts of the Colonies is being severely felt by stock-owners and farmers, whose losses have in consequence been considerable, and unless we are favoured with a general downfall of rain many will be ruined. This is indeed sad to contemplate, and any suggestions that may be made or plans submitted with the view of guarding against a future loss from a like cause or mitigate the present state of matters should be received with every consideration.

That the various Governments recognize the vital importance of obtaining water in the interior is evidenced by the fact that all have during the last sessions of their respective Parliaments voted large sums of money for this special purpose, either by storage or tapping a subterranean supply by well-sinking and boring. The scientific Societies of the various Colonies have for years past collected valuable information in connection with underground supplies of water, and have promptly made the results of their investigation and observations as public as possible. Individual scientists have also from time to time given publicity to any discoveries they may have made, and generally treated the subject with an earnestness that cannot be too highly commended, and could only emanate from their having fully realized the vast importance of the subject and the influence it has upon the future welfare and development of the interior of our continent.

Scientifically, the subject has received and is receiving careful study. As instances of this fact, take the annual report of the learned President of the Linnean Society, and also the writings and reports of the Geological Surveyors, the Government Astronomer, the Government Geologist, Professor Tate, the Deputy Surveyor-General of South Australia, Messrs. Abbott, Sanger, and many others. The latest and most interesting discoveries are ably described by Dr. Cox in his annual report which I before mentioned, and all who read that report must feel convinced that there are immense subterranean stores of water in the interior which only require tapping to yield unlimited supplies, and that, with the aid of science, we can determine—(1st) where water can be obtained by penetrating a certain stratum which is known to underlie the surface in a particular locality; (2nd) the probable depth at which it will be penetrated; (3rd) where water cannot be obtained, the geological stratification and previous experience proving the impossibility of doing so.

These determinations of science are positive, and have quite recently been put to the test in two very different and distant localities—(1st) in the back country of the Great Australian Bight; (2nd) in Central Australia, a little to the west of the border of Queensland and South Australia.

Some time back it will be remembered that Professor Tate, Geological Lecturer at the Adelaide University, was engaged by the South Australian Government to report upon the possibility of obtaining a subterranean supply of water in the back country of the Great Australian Bight. After a careful examination of the country, the Professor arrived at the conclusion that there was no possibility or probability of obtaining such supply. The Government, however, acting upon the advice of their Surveyor-General, took a different view, and decided to send a large and expensive boring plant to test the question, the result being a decided triumph for science and the Professor, no water having been found and the work abandoned. 2nd. Mr. Sanger, in his report to the Surveyor-General of South Australia on the Geology, &c., of the country between the Government Gums and Cooper's Creek, says, in reference to the possibility of obtaining a water supply by boring:—

"As the great want of the country is a good supply of water, a few words upon the possibility of obtaining it perhaps will not be amiss. Surface sinking has been generally practised by the squatters, and has met with varying success—more frequently salt water has been obtained than fresh. When, however, fresh water has been obtained, the supply has generally proved to be variable, as it depends upon local rains. Wells are generally, in the sandhill country, sunk in the beds of the dry watercourses. I have not heard of any of them lasting over two or three dry seasons. This is no more than can be expected, as the water rapidly soaks away through the porous sand and limestone underlying the alluvial clay—in fact it is only the imperviousness of the blue marl that causes the supply to last as long as it does. With boring, the case is different. The sand and limestone can be passed through and water reached at great depths,—in the region between the Government Gums and Manuwaukaninna, boring would meet with success if attempted in any of the synclinal troughs indicated in the section. The basins are often many miles wide, and accordingly receive the drainage of a large extent of country. The water soaking through the tertiary beds accumulates on the hard impervious rocks below. If, therefore, boring was attempted near the centre of the basin the largest supply of water would be obtained. Any person possessing a knowledge of the rudiments of geology could at once recognise the synclinal basins, and by obtaining the dips of the beds on both borders of the trough the thickness of the beds and the depth at which the older rocks would be reached could easily be calculated. [Mr. Sanger gives a rule of calculation, illustrated by diagrams.] It is probable that the boring would have to be continued into the slate, as water will percolate through slate when it is cut up by cleavage planes, and such is the case with most of the slate underlying the tertiary beds between the Gums and Manuwaukininna. In the sandhill country a fine supply of water would be obtained by boring in any place through the tertiary beds of the older rocks. The boring would have to be carried to great depths however to reach the older rocks—probably at least 500 or 600 feet. But it is also probable that a fine supply of good water would be reached before that depth—in fact, as soon as the hard limestone formed in deep sea was reached. (See *supra*.) If such wells were established, they would do more to open up the country than anything else, and would also greatly facilitate the transfer of Queensland cattle to the Adelaide market."

Attached to the report is a note by the Surveyor-General:—"I fully concur from actual knowledge in the truth of most of Mr. Sanger's remarks."

The lessee of a large tract of country in that vicinity decided to try a few bores, and some three months ago I received a communication from him informing me that water had been struck in the 3rd bore tried, at a depth of 255 feet, quantity and quality fair. Awaiting further particulars, I presume the limestone in deep sea had been reached, and Mr. Sanger's predictions realized. The teachings of science have lent us valuable aid in solving many difficult problems in connection with underground stores of water which a few years ago seemed insuperable. Speaking as one deeply interested in the matter, I hope that we may continue to profit by science, and never neglect her aid in our attempts to obtain subterranean supplies of water. There are only two means by which we can secure a supply of water in Central Australia, or, as it is very appropriately called, the riverless country, and they are—(1st) storing the surplus rainfall in dams and tanks; (2nd) tap an underground supply by sinking wells and boring. In many parts of the Colonies the only means by which a supply of water can be secured is to store the rainfall in tanks or dams; the cost of doing so being always in proportion to the quantity or nearly so, and the quantity required is inversely as the acreage occupied; the selector or farmer requiring a larger quantity of water per acre than the squatter, though the holding of the former may only be 1-60th of the latter. I have had many opportunities in my travels through the Colonies of discussing the water question with both squatters and selectors, and was not a little surprised to find how few of either could, with any pretensions to accuracy, tell me how much water they would consume in any given time. They could tell me how long the last drought had lasted, from six to eighteen months, according to the locality, and they might experience one still more protracted; and I was even more surprised to find, that although they possessed this knowledge, they had not made anything like an adequate provision to meet the contingency. Out of curiosity I measured a number of tanks and dams upon stations and selections, and found that few would contain a sufficient quantity of water to tide their owners over a six months' drought. What then can they expect should the drought last for a greater length of time? Certainly nothing but disaster and loss. They possessed the remedy, indeed had it in their own hands, but failed to make use of it at the proper time. The result is that thousands of pounds have to be spent (really lost) in obtaining temporary

temporary supplies and affording temporary relief. Had the thousands now being lost, not only by the Government but by private individuals, been expended on permanent works, how much misery and loss would have been averted. In this matter the selector generally, but most unjustly, blames and abuses the Government for having sold the land without previously or subsequently securing them an ample supply of water. The very weak principle of looking to and awaiting for the Government to supply almost all local requirements of whatever nature they may be, has unfortunately obtained a wide-spread hold upon the minds of all classes in the Colonies, and in reference to this particular subject has certainly resulted in checking and discouraging any effort of individual or collective enterprise to supply the want. Example: A particular local improvement is found to be urgently required by the residents; a deputation is appointed to wait on the Minister; they are well received and a promise given that their wants shall be considered, &c., &c., then probably the matter ends; the people put up with what may be a great inconvenience, hoping every day that Government will do—well, what they ought and could have done themselves at first. Take the wants of Temora as an instance of this, the water supply specially, and could any one think it possible that such an important gold-field would, as it is to this day, be without an ample supply of water had the people been left to depend upon themselves and not upon the Government.

Governments can only move slowly unless pressed by emergency, and all must know how impossible it would be for any Government to undertake the provision of all local water supplies and carry them out within a reasonable period. The question as to whether they should undertake any such works is a debatable one. Our Colonial Governments could not possibly undertake the cost of providing general or national supplies of water such as the Indian Governments have done, but I think it would be wise on the part of each Government to come to some definite understanding with the people in regard to the water supply question. Existing arrangements are very unsatisfactory—a million being voted for the Sydney supply, and ten or twenty thousand for the interior. A recent writer suggests, "That the Government should decide definitely—the extent of help they are willing to give; to what extent people will be left to make their own provision; and the direction in which the most assistance will be given." Had any such regulations been in force in this Colony years ago, I think much of the loss and disaster brought about by the present drought would have been averted, because I feel assured that private enterprise would have provided water supplies for many who expected and considered it the duty of the Government to provide for them.

Tanks.

The selector is the greatest sufferer in time of drought, and his first and most important duty when taking up his selection is to provide an ample supply of water. The quickest way of doing this is to excavate a small tank or surface dam, the latter being more generally adopted, and in the majority of instances they are too small, too shallow, and too much exposed to be depended upon, because they soon dry up by evaporation alone; they should therefore be dug as deep as possible, the smallest water surface exposed to the atmosphere that circumstances will permit, and should in all cases be securely fenced, and, where practicable, covered. Many small reservoirs I have seen spoiled and rendered worthless through cattle and horses having free access to them. The limited area of selections generally is a great obstacle to the construction of large dams, either from the limited watershed area, or the want of natural facilities. The selector must in such cases resort to the construction of underground tanks to secure his supply.

The site of the tank should be very carefully chosen, the base of a gentle slope being the most suitable, and should be so situated as to be free from ever receiving the drainage of the stable, cow-sheds, sheep-pens, or other out-buildings connected with the house, but sufficiently near to be of easy access; and in order to ensure a supply from a very small rainfall, the sloping ground above the tank should be specially prepared in the following manner:—Remove the whole of the vegetation, say over an area of 60 yards square, with a sharp spade, taking care not to break or cut the natural surface more than can possibly be avoided; a roller if at hand should then be run over it, but if not, the loose places should be rammed or patted down with a light rammer or the back of the spade. The vegetation as it again grows should be carefully cut until it is altogether destroyed. In this way within a very short space of time, a hard and clean gathering ground will be formed, from which the water will run off almost as rapidly as from a shingle roof—very little loss being sustained from absorption—and with care it can easily be maintained.

The area I have given, 60 yards square, is about equal to ¾ of an acre, and is merely taken as per example, the size being dependent upon the quantity required to be stored. I have on several occasions clearly demonstrated that of a gathering ground such as I have described, it is possible to conserve 98 per cent. of the actual rainfall, whereas upon unprepared ground from 30 to 50 per cent. is lost by absorption. The cost of preparing the ground is small as compared with the advantages given, and the area can be increased in proportion to requirements. One man can prepare an acre in 2½ days. Any one who has had the opportunity or taken the trouble to inquire into the cause of the scarcity of water in many parts of the Colonies could only arrive at one conclusion, and that is—that such scarcity is in a great measure brought about by a want of knowledge of the quantity required, and the inadequate storage provisions made by the consumers. Now I think it would not be out of place to submit a few calculations that may be of service to many in the future; for domestic purposes, 3 gallons per head per day in the country is a fair supply—thousands now have to do with less—although more should in all cases be provided. Any consumer, whether squatter, digger, or selector, knowing the number of his household and the possible length of drought, can easily calculate the quantity of water he requires to store. Example: Say the household numbers eight, quantity consumed, 4 gallons per head per diem, length of drought, 300 days; he will therefore require to store $8 \times 4 \times 300 = 9{,}600$. A round tank 14 feet diameter and 12 feet deep will be of sufficient capacity to store that quantity, an ample allowance being made for evaporation, and each cubic yard excavated will store or contain 165 gallons of water (nearly). One inch of rainfall on half an acre of a properly prepared gathering ground, within twelve hours, would be sufficient to ensure that quantity being stored; one inch of rainfall upon an acre of ground being equal to 22,635 gallons. Underground tanks are I think also the best means of storing water for horses and cattle, because their actual wants need only be supplied, none going to waste as is the case if they have free access to the water.

The construction of underground tanks is, I need hardly say, an important matter; the circular form being decidedly the best, most economical, and easiest to construct. The earth is not of a sufficiently retentive nature itself to hold water without the aid of cement or lime to form concrete walls; and both those materials being dear, or not procurable, it is necessary for the selector to resort to clay puddle, which can be had for the making, and is in every respect equal to cement or lime for retaining water, if not exposed to the sun. Puddle-wall tanks are constructed in the following manner:—A circular excavation is first made, on the bottom of which is a layer of well mixed clay puddle, from 8 to 12 inches in thickness; upon this layer of clay the first course of brick or stone is carefully bedded; if stone is used, the thickness of wall should be 12 inches, brick, 9 inches; each course should be bedded or laid on soft clay puddle, the same as mortar, a space being left between the stone and earth-wall not less than 6 inches, which should be filled with stiffer puddle and well rammed, care being taken not to force the stone or brick out of position by the ramming. The wall should be carried up to about one foot above the surface and banked with ordinary earth, inlet and outlet pipes of wood being inserted a little below the surface level.

Tanks of this description cost in Queensland and South Australia from 1s. 10d. to 2s. 6d. per cubic yard of excavation. The materials required in their construction are obtainable almost anywhere at a very small cost. An ordinary labourer can do all the work necessary in their construction; and, as an expeditious and economical means of storing water, they are much superior to the ordinary surface reservoir or small dams now so largely used by selectors and others, and I would strongly recommend their more general adoption. Of course there is a limit to their economic utility as a means of storing and conserving water, but up to 150,000 gallons they are certainly superior in every respect to small dams and surface reservoirs; therefore their limit of utility will rarely be reached by the ordinary selector or farmer, and their more general adoption in the future would, I feel assured, mitigate many of the disastrous effects of a protracted drought.

Steam Excavators.

In those parts of the Colonies where a supply can only be secured by storage, the steam scoop or excavators recently imported to South Australia by Sir T. Elder and P. Waite, Esq., for excavating tanks and reservoirs upon their runs in the far north, are beyond all question the most expeditious and economical machines yet seen. Tanks of any size can be taken out by them to a depth of 30 feet or more, at about one-third the usual cost, and I most respectfully suggest that inquiries should be made by the authorities and private persons in reference to these machines, with a view to their immediate introduction into this Colony. I had myself statistics of their capabilities obtained when they were tested in Adelaide, but I have unfortunately lost them. Speaking from memory, I think their cost was something over £2,000; average daily work, 200 cubic yards; cost per yard being in proportion to the depth of excavation, the maximum being about 8d. per yard; and I think they are

now

now engaged in excavating tanks for the South Australian Government, on the road from Government Gums to Mount Browne and the Queensland border, at that price, viz., 8d. per cubic yard. The speedy manner in which they perform their work is certainly their greatest advantage, and their introduction would work wonders in many portions of the Colonies.

The steam excavators can only be worked where there is a supply of water, but they have been so designed as to use only a minimum quantity, and as they do so much work, a small supply of water will enable them to excavate a large dam or tank with a very small consumption of that element.

Dams.

The best mode of constructing dams has been so often discussed in the colonial Press that little can be said in reference thereto, still the following hints may prove of service to many who propose storing water by such means :—

In determining the site for a large dam, the feature of the ground and the material obtainable for its construction should be carefully considered, and should be as low as possible, in order to insure a large watershed area or gathering ground; the best site being where an embankment across a narrow gully or watercourse would embank a large basin. The material of the site of embankment should be either impervious to water or capable of being easily removed so far as they are pervious. A water-tight foundation should in all cases be secured. The best material for an embankment is dry clay, and should be put on in layers from 9 to 18 inches in thickness, the middle being kept lower than the face and back, and consolidated by ramming, dray traffic, or running a flock of sheep over it occasionally. The worst material for an embankment is a mixture of clay, sand, and loam, because the clay keeps the water in and the sand and loam absorbs it. All vegetable matter should be removed from the base of any embankment intended to impound water. The inside slope of the bank should not be less than 2½ to 1, the outside not less than 1½ to 1. The top of the bank should be perfectly flat, and not less than 3 feet above the highest water level, and should be as broad as ⅓ of the greatest height, and securely fenced, to prevent stock from treading it down. A channel should be cut at one end of the bank at the highest safe high-water level, of a sufficient capacity to carry off all the flood-water above that level as fast as it flows into the reservoir or dam, and of sufficient length to convey the water to such a distance as will not endanger the embankment and discharge itself again into the natural water-course. Dams that are not water-tight may in many cases be rendered so by ploughing or otherwise breaking up the surface covered by water, and, immediately after rain, running a large number of sheep over it.

Well-sinking.

A constant and good supply of water can in many places be obtained by sinking wells at a reasonable depth, especially in many parts of Riverina; and it would hardly be credited, although a positive fact, that twenty years ago the number of wells upon stations for 100 miles around Deniliquin could be counted on one's fingers. At that time a general belief existed that the country was hopelessly dry, that it was no use sinking wells, reference always being made to a well upon Warbreccan, at the "Crow's Nest," and another at Atkinson's Hill Plain. These wells had been sunk some years previous to my seeing them in 1862, but had never penetrated the water-bearing drifts. The supply they gave was truly limited, and the water unfit for domestic use. The "Crow's Nest" well was afterwards sunk deeper, and I have been informed that a good supply of water was obtained from it. Notwithstanding these positive proofs, I felt convinced that plenty of water could be obtained by sinking wells in any part of that country, and at a depth of from 20 to 100 feet, but I could not prevail upon any one to try. In 1864–5, by persistent argument, I induced Mr. R. Cauldwell, of Cobran, to sink a well at the Curran-hut outstation, and, greatly to the surprise of all, Mr. Lockhart the superintendent of the station in particular, good water in abundance was struck at about 26 feet. A few weeks after another shaft was sunk in the "Gotha" paddock, and one at the "Gums," all yielding unlimited supplies of good water. Since then water has been found at depths varying from 20 to 100 feet all over that portion of the Colony. Now, is it not possible that in some parts of the colonies a similar belief may exist, and be the means of deterring many, as was the case around Deniliquin, from trying to obtain a supply by sinking wells? With no desire to be censorious, I certainly think there are such places. I am the more inclined to take this view from the unsatisfactory answers received to the question I invariably ask, "Have you tried any wells about here?" The reply in one locality or district is "No, what's the good, the country's too dry." In another, "No, but I'm going too." In another "Yes." "A well was sunk over there (perhaps some miles away) by Mr. ——, but he got no water, so what's the use of sinking here?" In another, "Yes." "A well was sunk some years ago; it has water in it, but it is too brackish, &c.," and generally the matter to my mind is treated with too much indifference.

An underground supply of water may be obtained I think in many places by sinking wells, even where it is said such does not exist, but, like a lead of gold, it can only be found by prospecting, and I hope to see in the future a large amount of this description of prospecting done. It has resulted, I know of my own personal knowledge, in vastly improving the back country of the Darling, the plains to the west of Cooper's Creek, and in the north-western portions of Western Australia, and if prosecuted with intelligent vigour in the more settled districts must lead to similar results. While writing this paper, February 28th, I received an intimation from a friend in South Australia, that Mr. Frank Perry, of Orooroo, had struck a good spring of water in a shaft only 30 feet deep. This is in one of the driest parts of the Colony of South Australia. Water was never expected to be found under 200 or 300 feet, if found at all, and it certainly helps to assure us that by trying we may ofttimes meet with unexpected success.

"Where is the best place round here to sink a well?" is a question often asked, but not by any means easy to answer. In the lowest ground in the vicinity is a sort of general answer, though it must not be accepted as the best reply. Ascertain the dip of the strata, follow it as far as you can in its downward trend, and then try (*i.e.*, if the strata dip to the east, go eastward as far as you can follow without a break). No general rule can be laid down for guidance in this particular, with the one exception of attention to the dip of the strata. The whole thing is like prospecting for gold—*just sink and chance it.*

Boring.

Diamond drills, Peirce well-borers, and many other patents, we have been told for the last two years are going to work wonders for us in finding minerals and water. So far one may ask, "What have they done?" really little or nothing, and we cannot expect them to do much for some time yet, especially in the interior, on account of the necessary working plant being so heavy and expensive. That they will do much good I do not for one moment deny, and I should be glad to see them working everywhere; but while they are being introduced we still suffer, and it behoves us to make the best use of the appliances we have until the use of the Diamond drills becomes more general. The most important discoveries of subterranean supplies of water have been made with the common boring tools that have been in use for many years past. They may be rude and primitive in the estimation of boring machine patentees, but they have been exceedingly useful, and it is somewhat singular that their utility has not been availed of to a much greater extent. Doubtless their cost has had much to do with it, but this I have found to be greatly exaggerated, not by the manufacturers but by the persons who purpose using them. The general impression is that the cost of a common boring plant is between £150 and £200. How this impression has got abroad I cannot imagine, because it is so very erroneous. Any founder in the Colonies can supply the necessary tools to bore to a depth of (say) 200 feet for about one-third of that sum, or from £50 to £60. A very useful boring plant was supplied by a Sydney firm in October last, to go to the Paroo, for £57; its weight, including 10 lengths of 4-inch tubing, being only 16 cwt. 3 qrs; and several bores have been put down with it since that time from 80 to 175 feet in depth. Boring by hand cannot be carried to any greater depth than 150 to 200 feet advantageously, but, if necessary, a greater depth can easily be reached by sinking a shaft and working the bore from the bottom of it. Under any circumstances, boring from the bottom of a shaft is the most expeditious and economical way in which boring can be done, especially so where there is a great depth of alluvial to go through. Depths varying from 400 to 500 feet have in many parts of the Colonies been reached in this manner, without the aid of any skilled labour or patent appliances. Squatters, farmers, and miners form associations for the purpose of watching over and considering their respective interests, and money is liberally subscribed by them to defray the cost of doing so. The progress and future welfare of large districts in the interior depends mainly upon the water supply, a permanent supply being therefore of the most vital interest to all; and I would suggest the formation of local water supply associations, whose sole objects should consist in, if possible, securing a permanent supply of water for their district. Funds for the purpose would, I think, be readily subscribed, and it would be for the association to consider whether the sinking of wells, boring, or the construction of tanks and dams would be the better in attaining their object. Much valuable information

could

could be obtained on application to the Scientific Societies; and the Government would, I think, willingly send a scientist to advise such associations, and help them to determine the most suitable site for their operations. A few hundred pounds spent in this way would assuredly be productive of great benefit in many districts, and the necessary delay in waiting for the Government to undertake such works would be avoided.

A new boring machine, or a combination of two altogether different machines, has just been introduced by the South Australian Government, and is thus described in a recent report by an expert:—"At the waterworks yard in Adelaide the diamond drill (Docwra's Patent), and Mather and Platt's boring machine can be seen in successful operation; and from drawings and plans sent home by the hydraulic engineer, Oswald Brown, M.I.C.E., the Mather and Platt has been built to work in conjunction with the diamond drill, forming a most complete machine, and the only one of the kind in existence. It must be understood that the diamond drill works best in solid strata, and that where loose earth, gravel, or sand is met with, the drill is liable to clog or to be broken, and considerable delay is caused in the operation of sinking. With Mather and Platt's machine added the work can be prosecuted with more vigour and with a certainty of every obstacle being surmounted, whatever the nature of the strata that may be met with in going down to a depth of 2,000 or 3,000 feet. The majority of the diamond drills that are being used in Victoria for prospecting purposes produce a core varying from 2, 3, or 4 inches in diameter, but the Docwra machine will bore a hole 24 inches in diameter to any depth that may be required. Some idea of the magnitude of this boring operation may be formed when we realize the fact that in favourable country a man could be lowered through the largest tube to the depth of nearly half a mile below the surface. Not long since in the Chatham dockyard a bore was commenced at 23 inches in diameter and went down uninterruptedly to 750 feet, where it was necessary, on account of the shifting strata, to put down inner tubes and reduce the diameter of the core from time to time until the width was 13 inches at 900 feet, where water was struck. The New River Company in searching for water at Ware went down to 800 feet with an 18-inch core. At Collingham, in Nottinghamshire, a bore has been put down to a depth of 2,034 feet, and in Germany to a depth of 3,200 feet. In the two former instances the operations were under the superintendence of Mr. Thomas Ball, who has been engaged by the Government to superintend the machine of which we are writing, and who arrived in the Colony in October last. Mr. Ball has had some fifteen years' experience with diamond drills and boring machines of a kindred character, and he speaks in high terms of the one he is now using, which is most complete and fitted with all the latest improvements. The rods and tubes, however, which accompany the diamond drill are not of a size exceeding 12 inches in diameter, because for artesian well purposes the larger sizes are not required. As it has only within this last month been erected and tried, we cannot form any estimate of its capabilities. It has since been taken down and sent to Wilmington to bore for water. No particulars are as yet to hand of the progress it is making; judging from the trial, I should think it will fully realize the utmost expectations of Messrs. Brown and Ball.

Locking the Rivers.

Proposals have been submitted to lock our rivers, for the double purpose of securing an ample supply of water and constant navigation. Such proposals have, however, received little attention, in consequence of the enormous cost of the work, and the possibility of their greatly affecting present vested interests.

Irrigation.

Schemes for irrigating the great inland plains have been propounded by engineers and others at various times, but no works of that kind have as yet been undertaken. Some of these schemes were only possible upon paper, though seemingly elaborated with care and nicely wrought out, all of them being crude in the extreme, and evidently propounded without any knowledge of the physical or topographical features of the country which they proposed to irrigate. In laying out these schemes the propounders had evidently overlooked or were ignorant of the engineering laws which experience has taught us should be the first and most important consideration in all irrigation works. In no single instance had any surveys been made by the proposers, nor had they even examined the ground or land which their scheme was to benefit so much. The success of any such proposals depends entirely upon the area of land irrigated, and that could only be determined by first knowing the proper inclination to be given to the surface of the canal; and the only means of ascertaining that would, of course, be by actual survey. The profile course of a river having its rise in the higher lands and gradually flowing into the plains below describes a curve concave to the horizon throughout, but more inclined near its source than elsewhere, and as it occupied the lowest line in the valley through which it flowed, the elevated land on each side was, of course, entirely cut off from irrigation. The longitudinal profile of the irrigation canal leading out of any such rivers should be, as near as circumstances will permit, a regular inclined plane, whereby the altitude above the river valley was everywhere increased, except at the extremities, and the lateral high lands correspondingly governed, it being evident that the greater the elevation of the head of the canal the greater the area of land irrigation.

In order to give some idea of the crudeness and impracticability of some of the schemes, I will give you a few particulars of two that were submitted a few years ago:—One to irrigate the great plains between the Darling, Bogan, and Lachlan Rivers, by means of a *large canal upon the Indian principle*—whatever that may have meant—the supply to be taken from the Darling River about Bourke. It, however, fell through when it was discovered that the elevation of the land proposed to be irrigated was greater than the source. The summer water level of the Darling at Bourke is only about 360 feet above high-water-mark, Port Jackson; its fall per mile being a *few inches*, consequently it would only be possible to irrigate a very narrow strip upon either side of its own valley, that is, if the supply be taken from the river itself. The source of supply for any irrigation scheme should have a good elevation, in order to facilitate distribution; this cannot, I think, be obtained from either the Darling or Murray Rivers, though it may be possible in many others. A proposal was also made to irrigate the Murray scrub and supply the city of Adelaide with water from the Murray; it was, however, found that the Murray at Wentworth, some distance above the source of supply, was actually 130 feet below the city level, and about 150 feet below the scrub proposed to be irrigated. It may be of interest to many members of the Association to know that the summer water level of the Darling and Murray Rivers at their junction, is only about 9 feet above high-water-mark at the Murray mouth, or where it flows into the sea. The fall per 100 miles in the Murray River, from Wentworth to its confluence, is not more than 1 foot 3 inches. From 6 to 8 inches fall per mile being necessary for an irrigation canal, I think we may conclude that neither of those rivers can be utilized for irrigation purposes by means of gravitation, beyond, as I before remarked, a limited area upon either side of their own valley. Irrigation schemes, from their great magnitude, must necessarily be *national works*, and therefore, only within the province of Government to undertake. One of the best authorities upon this matter states, that—"It is almost useless to irrigate a valley unless it is first opened up by good roads and railways." Consequently, the question of undertaking gigantic schemes of irrigation will doubtless receive but little attention until our various railway systems are almost perfected.

It was not my intention to have said anything about irrigation in this paper, and I have only done so in order to show how chimerical some of the schemes submitted were. I will do the propounders the justice of saying that they acknowledge *being ignorant of the physical and topographical features of the country they proposed to irrigate;* at the same time I think they committed a grave error in proposing impracticable schemes, and I would strongly recommend any others who may be ambitious of treating the subject of irrigation, to sacrifice the theoretical for the practical. The difficulties which stand in the way of adopting any system of irrigation in Australia are more attributable to the physical features of the country and to the nature of the soil than to an absolute deficiency of water. We have from time to time been told of the great good that irrigation has done in Italy, India, Spain, and California, but you must know that the natural features of those countries are so essentially different from those which prevail in this continent, that systems of irrigation which become almost matters of course in those places are absolutely inapplicable here. The great difficulty we have to contend with in Australia is the finding of suitable sites for large reservoirs in which the water could be stored. Sites can be found and reservoirs made, but the question of cost is an important one, and one on which we possess no reliable information. One thing, however, is certain, and that is, that very little has been done in the way of storing large supplies of water anywhere in Australia, but I believe the time is not far distant when the water question will become as much a matter of State policy as railways now are. Irrigation works and the construction of reservoirs are too costly to be undertaken by the selector or digger. On a small scale the results have in no instance justified the outlay. Then the conditions under which pastoral lands are leased are not specially favourable to the investment of large sums of money in making reservoirs of a permanent character or very large dimensions. Hence my reason for concluding that national water supplies will become a matter of State policy, and, judging from the experience of other countries, they will certainly be reproductive works.

Weirs.

The construction of weirs near the confluence of the many creeks and watercourses that feed our rivers is a question worthy of very great consideration, both at the hands of the Government and the holders and lessees of the pastoral lands in the river country. From actual surveys which I have made on the Darling, Barwon, Warrego, Lachlan, Murrumbidgee, and other rivers, I know many places where a weir thrown across the confluence of a creek or watercourse would impound millions of gallons of water, not concentrated in one large basin, but extending miles into the dry back country. Any one who has been on those rivers during flood-time must have noticed the immense expanse of flood-waters, and the distance into back country to which the water extends, and have often heard it remarked, "What a grand country it would be if the water could only be kept at or near the flood-level." No effort has as yet been made to keep it, excepting in one instance, I believe, by Mr. J. Tyson. Many large and expensive dams have, to the credit of the pastoral lessees, been constructed, but their holding capacity is very small as compared with the quantity that would be impounded by the construction of a number of weirs in the creeks and watercourses, which intersect almost like a network the whole of the river country. Before submitting this proposal, I collected reliable data, at no little trouble and expense, upon which my calculation of the cost of the construction of the weirs and the quantity of water impounded, should be based. The following figures will, I have no doubt, surprise many members, but I can guarantee their accuracy. The construction of two weirs in a watercourse upon the west bank of the Darling River, at a cost of £2,990 each, would impound 7,000 millions of gallons of water (sufficient to supply the city of Sydney for five years)—cover at flood-level an area of about 14,000 acres—extend back from the river 18 miles—and give a water frontage of about 61 miles. The weirs being respectively 17 and 21 feet in height and 93 and 104 feet in length, and 8½ miles apart. In another place, a weir 60 feet long, 16 feet high, costing about £1,700, would throw the water back 16 miles, and impound upwards of 1,000 million gallons of water, and give about 70 miles of water frontage. It must not be imagined that results such as I have given would be obtained by the construction of weirs upon any or every watercourse or creek, but I feel assured that their adoption as a means of economically impounding immense quantities of water is vastly superior to dams. A dam is entirely dependent upon the local rainfall for its utility, which may be, and is, uncertain. The weir impounds flood-water, which occurs periodically, and can be relied upon to a much greater extent. The mode of constructing the weirs is important, and should, I suppose, be described in detail. On the Darling and some other rivers, stone not being so plentiful as at Pyrmont, we have to look around and obtain the best substitute, and that is cement, concrete, or beton blocks; their manufacture is simple and can be performed by ordinary labourers, and they possess the advantage of being easily moulded to any required shape and size. The component parts most suitable being one part sand, seven parts gravel or broken metal to one of cement, or eight parts of river gravel to one of cement. Gravel being found throughout the whole course of the rivers would be the material mostly used, and if well mixed with the cement in the above proportions, forms an artificial stone equal to the best sandstone; its cost being about 1s. 3d. per cubic foot.

The section of the weirs should be in all respects similar to those constructed by the irrigation engineers in India—upon the Godavery and Toombuddra works—and consists of a brick or stone wall 2 feet thick in front, having a batter of 1 in 1½; the rear wall being more perpendicular and composed of heavy blocks; all joints to be laid in cement; the space between the front and rear wall to be filled with river gravel, lime, and cement, in the proportion of one part cement, one part lime, and twelve parts gravel; the top should be narrowed to (say) 5 feet, the coping being of large blocks 5 feet long, and not less than 2 feet 6 inches wide, and 15 inches deep, tied together in the front with dowels, and at the back with iron clamps; sluices or gates being inserted near either end, to let the flood-water in or out as required. At the back of the weir or on the river side of it, a timber framing would have to be put in, composed of large logs laid in rows longitudinally and transversely upon each other, about 1 foot apart and three or four rows high, properly secured to the weir in order to form a cushion for the overflow-water and to prevent the earth from being washed away from the back of the weir. The height of the weir can only be determined by observing the highest known flood-level, and it should be at least 2 feet below it. I estimate the cost of constructing such weirs at £2 per cubic yard of their whole content, including the cost of the timber, &c. Putting it another way, the cost of impounding 100 million gallons of flood-water would average about £120. However surprising or startling these figures may be, they are not imaginary but real, and based, as I before said, upon actual survey. In many places I have no doubt the ground will be porous, and a large proportion, probably the whole of the water, may soak away, but I think it would take a considerable time to do so; and this, judging from the experience of Indian engineers, would not be likely to occur more than once, as they have found that the silt deposited from flood-waters acted as puddle and prevented the escape of the water. Assuming that it did escape, I am still of opinion that the value of extra grass grown around the water edge as it gradually subsided would be ample compensation for the cost of constructing the weir. This might in some instances be avoided by constructing another weir higher up the water channel, upon ground of a more retentive nature. The impounding of the flood-waters in the manner I propose would, I feel convinced, result in great benefit to many; and I would again urge the Government, stockowners, and all others interested, to give the proposal their earnest consideration. If I have omitted any information which it may be thought by any I could supply I will gladly do so, knowing that the securing of an ample supply of water means not simply convenience to a few people, but extension of settlement, utilization of land that would without it be utterly waste or nearly so, and an increase of wealth to the Colonies. Probably in no country in the world is the necessity for the due adjustment of those natural influences which produce fertility more fully exemplified than Australia. Only small portions of our continent possess what is usually known as a permanent supply of water for domestic and other purposes; and owing to the irregularities of the rainfall causing sometimes an excess and at other times a deficiency of moisture, the skill of the scientist and engineer is required to reduce those irregularities to a minimum.

In a short paper such as this full justice cannot be done to all the subjects I have touched upon, *i.e.* boring, well-sinking, dam-making, irrigation, and the construction of weirs. Each one should, I think, be treated separately and practically, and I hope to see some of the members do so. Water is the question of the future for the engineer in Australia.

There is no doubt that huge volumes of water descend upon the surface of the earth in Australia, and it is equally certain that no proper effort, or rather no effort at all, is made to preserve and turn to profitable uses that which Providence bestows upon us from year to year, and the engineer who can do so in the most economical and expeditious manner has a large field of usefulness before him. I have written this paper, hoping that by doing so I might be instrumental in inducing abler and more influential men to take up the subject, and draw the attention of the general public to its vital importance.

Summarized—I would strongly recommend—

1st.—The construction of underground puddle wall tanks where a subterranean supply cannot be obtained by boring or well-sinking. Under any circumstances, in new settlements, it is the most expeditious and economical method of securing a supply of water.

2nd.—Sink trial shafts where there is any probability of obtaining a supply by that means.

3rd.—Bore wherever the geological stratification is favourable. The small plant necessary can be had for about £60, and is therefore within the means of all. When the water is found, larger and better machinery can be obtained to increase the supply if necessary.

4th.—Establish local water-supply associations, with the view of their ultimately becoming "Water Trusts."

5th.—Introduce the best steam excavators for use in places where labour is scarce, and also the most improved boring machines, especially those that bore holes of large diameter; the quantity of water raised from a bore being in proportion to the size of the hole. The larger the bore the better the machine.

6th.—Construct weirs in approved situations near the confluence of the watercourses and creeks that feed, or are fed by, the large rivers at times of flood, so as to impound the waters at their highest flood-level. By constructing weirs as I propose, it is quite possible that a large quantity of the water might be utilized for irrigation purposes, probably not on an extensive scale, but of sufficient magnitude to enable us to determine what is best to grow and how to grow it. The experience thus gained would be of great value to the engineer and capitalist, should they contemplate undertaking any large irrigation works.

APPENDIX I.

APPENDIX I.

TANKS AND WELLS OF NEW SOUTH WALES, WATER SUPPLY AND IRRIGATION.

By A. Pepys Wood, Assistant Engineer, Roads and Bridges Department.

(Read before the Royal Society of New South Wales, 7 November, 1883.)

THE necessity for a liberal consideration of the question of water supply for the dry districts is of such rapidly increasing importance to those districts and to the Colony generally, that the time has arrived for active steps to be taken to obtain, by actual survey and observation, the data necessary to determine the best means to be adopted to conserve and distribute, in an economical and effective manner, that portion of our rainfall now carried off by our river systems and discharged into the ocean, conferring but little benefit on its course; though running through districts where the soil only requires its invigorating agency to produce in abundance any vegetable growth suited to the climate.

In framing this paper I have divided the subjects to be dealt with into two sections:—

I.—Water supply for stock routes. II.—Water supply for irrigation.

This course is advisable for two reasons: because the works to be dealt with, that have up to the present time been carried out by the Government, have been solely for the improvement of the stock routes; and because the important works necessary on these routes cannot generally be brought within the scope of any scheme having irrigation as its main object. Isolated cases may occur where watering-places could be provided for in this way, but as a rule it will be found that the supply for this purpose must be obtained from works complete in themselves, and constructed solely with a view to meet the requirements of stock traffic. This is a necessary consequence, inasmuch as stock routes are laid out to afford the best and shortest practicable connection between the terminal points, and without any reference to those differences of level that would prevent their being introduced into a general scheme of water supply. Cases might occur where points on such routes could be supplied from the irrigation channels, but such points might not be suited to the general division of the watering stages along that route.

I.—Water Supply for Stock Routes.

The stock routes of the Colony have an important bearing on pastoral industry, and deserve greater attention and expenditure in opening and improving them than they have hitherto received. Much may have been done, but very much more remains to be done before they can be considered efficient in facilitating the transmission of stock. They are the only avenues from the pastoral districts to the consumer, and from one pastoral district to another. Properly watered and managed they would be invaluable as affording a certain outlet to the markets, and also as a means of reducing to some extent the enormous losses that so often overtake the sheep-farmer during dry seasons; for at such times he would have the chance of removing some portion of his stock to more favoured localities for water and feed. It has unfortunately been the case that, even when improved, these routes have not been of as much service as is desirable. This is to be attributed to the long intervals separating many of the works that have been constructed for watering purposes, to the defective maintenance of many of those works, and to the defective conditions regulating grazing on the stock routes. When it has been determined to water any stock route, arrangements should be made to construct all the works necessary to complete the chain of communication, instead of constructing watering-places that, until that chain is complete, can only be rendered available at considerable loss and injury to travelling stock, or when the long intervals separating them are bridged by natural supply, at which time there is but little need for the water that has been artificially conserved. It is unfortunately often the case that many of these routes are practically closed, by want of feed, even when plenty of water is obtainable; and it is a matter of great importance that this evil should be remedied as far as is practically possible, and measures adopted to make the stock routes of sufficient width, to withdraw them from lease, and protect them from being grazed on by other than travelling stock.

In the year 1869, the Government first practically recognized the necessity for constructing watering stations on the stock roads, and a sum of £5,000 was then voted by Parliament for works on the Booligal and Wilcannia Road, and handed over to the Roads Department for expenditure. At that time no works of a similar nature had been carried out by the Government; and this, combined with an imperfect knowledge of the character of the country to be dealt with, led to a course of action being adopted which, however suitable it might have proved under different circumstances, required considerable modification to adapt it to the existing conditions of the question. The primary object was to obtain water by sinking, and with this view a boring plant, consisting of the ordinary rods and bits, was sent on to the ground, to test the nature and depth of the strata and the quality of the water to be procured.

The preliminary borings were commenced on the 1st October, at the Jumping Sandhill, about 30 miles north of Booligal, and were completed at Mount Monahra, about 120 miles from the same place, in January, 1870. The camp was then broken up, as there was no water on the "Death Track" between there and Wilcannia, a distance of 80 miles. To have carried out the works along that line would have necessitated a very heavy expenditure for haulage of water. In addition to this there were other reasons for suspending operations, chief of which were the difficulties experienced in obtaining and keeping efficient men, the high cost of labour, and the comparatively small depth to which the borings had to be carried. This latter cause had a most important bearing on the question, for it was found that the time occupied in shifting a large camp from one site to another, and in making the preparatory arrangements for boring, raised the cost of the work to a great extent. Had the drifts that were tested been deeper seated, the borings could have been carried out at a proportionately less cost per foot. The experience gained during the work was wanting at the outset; but, though it can now be seen where mistakes were made and unnecessary expenditure incurred, it must not be forgotten that the Department acted for the best and carried out the work under very considerable difficulties; further, that the experience gained, though perhaps rather costly, has been of much value and an eventual source of economy.

Looking back at those early efforts, there can be little doubt but that the better plan to have adopted would have been to have made a preliminary examination of the district in the first place, ascertaining how far it had been tested by works carried out by the Crown lessees, gaining information as to the depth and character of springs in existing wells, their positions, and the cost and character of works best adapted to the object in view. Sites could then have been determined, and tenders at once invited for sinking wells where there was a reasonable probability of obtaining suitable water. Where existing works proved that wells were not advisable, arrangements could have been made for works to conserve storm-waters; and in case of the surface features being unfavourable for tanks, the locality could have been tested for an underground supply by *letting* trial shafts, and possibly boring from the bottom of them for deeper seated springs, if considered necessary. Day labour would have been avoided in every possible way, for all the drawbacks connected with it in the settled districts were very much intensified in that back country. The works would then have been completed much sooner, and, as the cost of preliminary operations and of supervision would have been considerably reduced, there would have been a larger amount left for opening the road.

When the explorations were concluded, tenders were invited for the works determined on, and the following tanks and wells were at once put in hand, and completed in 1872:—

Well near the Willandra, at Mossgiel. Tank at Boonoonoo.
Well at Ivanhoe. Well at Mount Monahra.
Tank at Forty-eight-mile Swamp.

Since these were completed, further sums were voted, which have been expended as shown in the following list:—

Deniliquin to Hay—Pine Ridge—Dam.
" " —The Gums—Tank.
Hay to Booligal—One-tree—Tank.
" " —Quondong—Tank.
Booligal to Wilcannia—Jumping Sandhill—Well.
" " —Holy Box—Well.
" " —Twelve-mile Swamp—Tank.
" " —Thirty-five-mile Swamp—Tank.
Wilcannia to Hungerford—Copargo—Dam.
" " —Peri Sandhill—Tank.
" " —Nipper's Creek—Tank.
" " —Warramurtie—Tank.
" " —Gambolara—Tank.
Balranald to Ivanhoe—Box Creek—Tank.
" " —Youhl Plains—Tank.
" " —Till-Till—Tank.

Cobar

Cobar to Nyngen—Booroomugga—Tank.
" " —Muriel—Tank.
" " —Hermitage—Tank.
Cobar to Bourke—Cobar (Stock)—Tank.
" " —Cobar (Town)—Tank.
" " —Nullima—Tank.
" " —Tindary—Tank.
" " —Currawcena—Tank.
" " —Corilla—Tank.
" " —Two Water-holes—Tank.
Cobar to Louth—Cutty-gullaroo—Tank.
Bourke to Ford's Bridge—Tank.
Walgett to Bangett—Boro Water-holes—Tank.
" " —Lightning Ridge—Tank.
Barwon to Narran—Cumborah—Tank.
Narrabri to Moree—Galathera—Tank.
" " —Boggy Creek—Tank.
Wagga Wagga to Bland—Junee—Dam.
" " " —Wallace Town—Dam.
Wagga Wagga to Cootamundra—Hurley's—Dam.
Albury to Tocumwall—Major's Water-hole—Dam.

In 1882 a sum of £50,000 was granted for tanks and wells, and arrangements were made for its expenditure on the different stock routes recommended by the Mining Department. This amount was so much in excess of any previous grants, which had hitherto been of a desultory and intermittent character, that it was considered advisable to frame and adopt a more systematic course of action; and with this view, type drawings and specifications were prepared, embodying the results of the experience gained by the officers of the Department during the time they were engaged on this duty. This course was considered all the more necessary, as the large increase on previous grants indicated a recognition of the growing importance of the question; a recognition which will probably be followed by a development of present operations, so as to include the more important works connected with a general scheme of water supply for irrigating portions of the rich but arid districts of the Colony. A further sum of £53,800 was voted on this year's estimates, which with the amount granted last year, is being expended on tanks and wells as rapidly as possible; but great difficulties have been experienced in getting contracts for their construction taken up, the seasons having been exceptionally unfavourable for these operations. This has in many cases considerably increased the cost of the work: but it was considered advisable in the more urgent cases to carry out their construction at once, even at an increased outlay, rather than delay it to a more favourable season.

The works by which the stock routes have been supplied, or partially supplied, with water, may be divided into the following classes:—

1. Wells, 2. Tanks, 3. Dams,

and it will be advisable to deal with them in this order, describing the nature of the conditions surrounding each class, and the operations that have been and are now being carried out by the Government, in endeavouring to construct works that, while economical in detail, will at the same time ensure a permanent supply of water both for stock and human consumption.

1. Wells.

The conditions under which drift waters are obtained, and their important bearing on the settlement of the dry districts of this Colony, give this branch of the subject as great an interest as any with which we have to deal. This interest is, in a measure, due to the difficulties surrounding a satisfactory solution of the origin of, and the varying conditions under which these waters are discovered; but still more is it due to the fact that this source of supply, when the quality of the water is suitable for stock, is at once the most certain and economical means of meeting the great want which settlers in that country have to contend against. So far our experience of the question may be considered as confined to the more shallow-seated and unfortunately non-artesian drifts; but it is a matter for congratulation that money has been voted by Parliament, and operations commenced for testing the great west and north-west country for a deeper seated and hoped for artesian supply. Should the predictions regarding the existence of such a supply prove well founded, and the water that may be discovered prove suitable for stock, or still further, for irrigation purposes, it will be almost impossible to estimate the increased facilities that will be offered to settlement, or to assess the increased value of that portion of our territory.

Whether the predictions are likely to be realized appears to be a question that can only be satisfactorily settled by the *boring-rods*. Theorizing, though much has been indulged in, has so few well ascertained data on which to build hopes of an ever-flowing, inexhaustible supply, and is opposed by so many ascertained facts proving the uncertainties connected with the discovery of water in the shallower drifts, that we may, if hopeful, wisely be doubtful, till all room for doubt is disposed of by actual test.

Many reasons have been advanced by the advocates of an artesian supply to support their views; amongst others, the mud springs between the Darling and the Paroo, and the height to which water has risen in some of the deeper wells north of the Darling. These are *facts*, but whether they are entitled to the wide interpretation given to them—whether they indicate *general* and not merely *local conditions*—remains to be proved.

The Government Astronomer, in his "Rain and River Observations" for 1880 and 1881, has published some very interesting reports bearing on this question; but it may possibly be found that the deductions he has drawn may be capable of very considerable modifications when the conditions connected with the rainfall on the Darling basin are investigated. In his report for 1880 he writes:—"Since the rain measures of 1880 and the river measures for the same period are more complete than they have ever been before, it will be worth while to test one by the other. I have before endeavoured to prove that the water passing down the Darling in an average year is only a very small portion of the rainfall, and is in fact very much less than must be available for that purpose, after every allowance that can be made for evaporation and vegetation. For 1880 we have the means of testing this question by observations more complete than any which have previously been taken over the best part of the watershed of the Darling, that is the western slopes of the Main Range, where, from the abundance of rivers and creeks, it is obvious that the rain-water readily runs off the soil. There are forty-five rain stations, and the mean rainfall derived from these is 20·74 inches; the area included is about 110,000 square miles; all the drainage from this country passes Bourke, in the river Darling, and at this point a daily record of the height of the river is kept, and the mean result shows that the river has averaged throughout the year 6′ 8″ above the summer level. The width of the river at Bourke is 180 feet, and the velocity when in flood is rather less than one mile per hour. A few figures, which I need not give here, suffice to prove that ¼ of an inch of rain over the watershed, or $\frac{1}{70}$ part only of the rainfall, represents all the water that passed Bourke during the whole year. When full allowance is made for the power of evaporation in a dry year, and for all other circumstances which might prevent the rain-waters reaching the rivers, it is certain that a very much greater proportion than $\frac{1}{70}$ becomes running water. In such country as that under discussion, common experience would give ⅓ of the rainfall as the available water, but for the sake of being on the safe side, we will assume that only $\frac{1}{70}$ of the rainfall becomes running water, and it still represents a quantity sufficient to supply eight rivers like the Darling for the whole year.

"It therefore seems impossible to doubt that an unlimited supply of water passes away underground, more in fact than would suffice to make the whole of the western districts a well-watered country, and all that is wanted to make this supply available is a judicious use of the *boring-rod*."

In his report for 1881 Mr. Russell further states:—"The evidence is conclusive that the annual supply from rain finding its way into this great natural storehouse is perfectly inexhaustible; it is also certain that as much must find its way out as in, every year, under natural conditions, and the few wells that have been sunk prove that the outlet is so situated that the water is under pressure in the reservoir, and will rise up to or above the surface when wells are sunk into it."

Mr. Russell speaks with no uncertain voice; and as his views have an important bearing on the question of water supply for these districts, both as regards wells and surface conservation, they are well worth our serious consideration.

The rainfall over the Darling basin above Bourke having been determined with more or less accuracy during 1879, 1880, and 1881, and the mean level of the river at Bourke having been also ascertained for the same years, we are enabled to make a rough comparison of the fall and discharge.

1879.—Mean rainfall...	33·24 inches.	Mean river level...	29·08 feet.
1880. " " ...	20·47 "	" " ...	6·66 "
1881. " " ..	18·88 "	" " ..	0·75 "

The proportional difference between the rainfall and the river discharge for these years is so great that it is necessary to try and discover a reason for the discrepancies, and then, if possible, show the connection this may have with the general question—that the enormous proportion of the rainfall, mentioned by Mr. Russell, disappears underground and feeds our water-bearing drifts.

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In 1880 and 1881 it will be seen that the rainfall was very near the same, yet in the latter year the discharge, which, if there were no disturbing elements, ought to correspond, was only ⅛ of what it was in 1880. Again, in 1879, the rainfall, which was 80 per cent. in excess of 1881, was accompanied by a discharge thirty-eight times as great. There must be some reasons for these differences, and as they have an important bearing on the estimated loss by a deep soakage it will be well to consider how they can be accounted for.

In the first place the mean rainfall must be considered, and by referring to the rain maps there appears to be a possibility that this has been over-estimated. These maps show that there are a greater proportional number of observing stations on the eastern side of the watershed than there are on the levels occupying the central and more westerly sections; and as the rainfall is greater on the eastern side, any preponderance of observing stations there must give an excess of the true mean, unless the area composed by each station is made an element in the calculation.

The discharge of the Darling at Bourke also appears to have been incorrectly estimated, and to be less than the actual discharge. The estimate is based on the velocity of the river in its normal state, that is, on the velocity when there are no disturbing influences, as when the river is in flood and full for a considerable distance above and below the point of observation. This velocity is estimated at nearly one mile an hour, and, with the cross section of the river waters at their mean level, forms the basis on which the discharge is calculated. If we examine the river curves at Bourke, we find that the floods are in many cases of short duration, forming a series of waves succeeding one another at longer or shorter intervals. This being the case, the normal velocity can scarcely be considered a satisfactory factor, as it should have an increased value when the river is at its higher levels and the water coming down in a wave. This is borne out by Mr. Russell's statement that a flood in November, 1881, travelled from Bourke to Wilcannia in three days—this gives a velocity of *seven* miles an hour.

The proportion of rainfall likely to become running water must to a great extent be dependent on the features of the watershed. On the eastern side, which is bounded by the coast range, the proportion must be much greater than it is on the levels, where but a very small percentage finds its way into the main channels; and when the rainfall is greatest on the eastern side of the shed, we must expect to find that a larger proportional quantity finds its way into the river than when contrary conditions prevail. *This was decidedly marked in* 1879, when there was such a great discrepancy between the *supposed* mean rainfall and the river discharge, as compared with the two other years quoted. The conditions under which the rainfall occurs must also have an important influence; the heaviness of the fall, that is, the quantity measured by the time; the intervals separating different falls; and the state of the ground at the time of the fall, whether dried and cracked by summer suns and capable of absorbing largely; or with a close saturated surface capable of throwing off the maximum proportion of the rainfall. Account must also be taken of the enormous bodies of water brought down by the rivers that are intercepted and diverted in filling lagoons, warrambools, swamps, and lakes; and that in heavy floods, are thrown back over the level country for scores of miles, and largely retained there when the floods in the rivers recede; retained in shallow creek beds and swamps, when the evaporation is enormous.

These causes—over-estimated rainfall—under-estimated discharge—*enormous* evaporation on the levels which form the largest proportion of the area of the basin—the loss in filling secondary channels, &c.—and the surface soakage—all taken together, may probably materially modify the results arrived at by Mr. Russell.

It may be advanced that the "surface soakage" just alluded to is the great source of loss, that, percolating to the lower drift beds, is their main supply; but the soakage referred to is of a very different character, and that it takes place to an enormous extent is known to all who are acquainted with the country under consideration. The dry, parched soil, seamed with cracks and fissures, hungrily drinks in the water falling on it, but the impermeable clay beds prevent its descent to any great depth, and the burning summer heats and dry thirsty winds rapidly evaporate the water lying on the surface of the ground, dry the soil, and the moisture carried away from the surface layers is replaced from below by capillary attraction, and exposed to evaporation under conditions which reduce it to vapour much more rapidly than it can take place from a water surface.

That there may be places where large quantities of water find its way underground, to supply the lower drift beds, cannot be positively denied; but that such wholesale percolation takes place generally is very improbable; and if the conditions advanced fail to support the view that this enormous loss by percolation does not take place, then it would be interesting to ask how this large body of water is disposed of; and how far our knowledge of the conditions under which water-bearing drifts are discovered in that country sustains or disproves the assumption that they are so lavishly supplied from the surface.

The geological bearings of the case I leave for those more conversant with that science than I am, but *en passant*, it would be interesting to ask this question—Where is the subterranean outlet for the enormous proportion of the rainfall that has been and is being absorbed on the Darling watershed above Bourke, if Mr. Russell's assumption is correct? Is not its escape to the ocean debarred by the older rocks that crop up through the alluvial deposits, and that extend from the dividing range between the Lachlan and Darling near Gilgunnia, through Cobar, and running northerly with some *surface* breaks, cross the Darling on to the Warrigall? It appears very probable that these older formations must cut off the alluvial deposits to the east of this line from those to the west, and therefore from the ocean, and that consequently the assumed percolation on the Darling basin should be stored locally, and that the increasing storage should show itself in an increasing rise in well waters in that district or in surface springs. But this is not the case. Again, assuming that this rock barrier does *not* exist, and that the drift beds are continuous to the ocean, we are met by as great a difficulty in reconciling such a discharge to the conditions of the case. A thousand miles of drift must oppose an insurmountable obstacle to a free discharge of water; and assuming that it has an existence, there should be a very perceptible rise in the levels of well waters, more particularly towards the eastern side of the shed and during wet seasons; this is however not the case.

Apart from these views, there are several other considerations that have an important bearing on the case, and that are difficult to reconcile with Mr. Russell's views. Those who have conducted boring operations or have sunk shafts in that country, or those who have watched and noted the work carried out by others, must be aware that in the alluvial country it is very rarely that water is missed at the ordinary depths of the shallower-seated drifts underlying those districts; they must also be aware that there are thick beds of stiff impermeable clays passed through before water is obtained; that water when struck rises to a greater or lesser extent, and then retains that level, independent of either long continued dry or wet seasons. The conclusions to be drawn from these works, which at intervals are pretty well scattered over that country, is that the water-bearing drifts and underlying clays are general. This being the case, how can the extensive soakage assumed to exist in accounting for the small discharge of the Darling as compared with the rainfall on its basin, be accepted as reasonable? Again, if instead of admitting general loss by soakage, we admit that it may occur on a large scale in certain localities, we have to face the same difficulty in reconciling a varying head of supply with a constant level in the wells tapping these drifts. If it is said that this uniformity is due to the fixed level of the discharge of the drifts beds it does not relieve us from the difficulty, for whether the level of the discharge is regulated by the ocean level or whether that discharge takes place before reaching it, there must be such an enormous length of drift to be travelled by the water before obtaining an outlet that the back pressure would be virtually equivalent to a seal. Again, if this constant feeding and escape of water is going on now it must have been going on for ages past, and it therefore appears strange that, as it had been found that brackish surface drifts improve by being worked, that all the brackish elements have not long since been washed out of the deeper drifts by the constant assumed flow through them. The objections now raised naturally point to an old supply for these drift beds—a supply which has remained stagnant and locked up for ages—a supply that is exhaustible with time and pumping plant, and which is so inconsistent with the views held by those who have fondly dreamed of perpetual artesian flow, that it is not at all likely to be kindly received by them. They have, however, the pleasure of knowing that their theories are opposed only by theory, and this shows the necessity that exists for obtaining, by systematic effort, data connected with this question; until this is done, all efforts to arrive at a satisfactory solution of the apparent inconsistencies which are constantly cropping up will be futile. Mr. P. K. Abbott collected many facts relating to wells in the Liverpool Plains district, and, in a very interesting paper read before this Society, in November, 1880, gives much valuable information bearing on the question in that locality. The observations commenced by this gentleman should be followed up in other parts of the Colony, the positions of all works of this character being determined and marked on a map; the level of the drift containing the water and the level to which that rises in the bore or shaft being shown in each case, and the levels reduced to a uniform datum. The strength of supply and quality of the water, with the influence of long continued droughts or wet seasons should also be noted. In the course of time, when the level above alluded to had been determined over a large area of country, it might be possible, *if there is any under-ground flow*, to plot a curve giving a value to the head of supply and the back pressure in these drifts. The general information, when a sufficient amount of it has been collected, might enable the courses of the drift channels to be traced, and save much loss of time and capital in uselessly sinking upon salt-water beds.

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In the works constructed by the Government for reaching, lifting, storing, and distributing underground waters, the shafts are slabbed right through, and divided into two compartments, each 2 feet 6 inches square, by a brattice extending from the top to the bottom of the shaft. The lifting appliances consist of a whim and gearing working two self-acting buckets, which discharge into a timber-framed, iron-lined service tank communicating with the troughing for watering the stock. In carrying out these works, great care has to be taken to have the slabbing thoroughly fitted, and clay well puddled into all spaces at the back of same. Care must also be taken to have the shaft carried down truly and having the runners properly fixed, as the smooth working of the buckets is dependent on attention to these points; while all roughness or jarring in their travel very soon loosens the slabbing and increases the cost of maintenance. Some of the water-bearing drifts are very troublesome and difficult to deal with, and in such cases if the water has a considerable rise, with a strong supply, it will often be found advisable not to sink to the drift, but to stop some few feet above it and then put down a carefully tubed bore to tap the water. Boring can also be advantageously resorted to in some cases, to avoid the necessity of puddling back water of bad quality—often a difficult and expensive operation—when it is underlaid by good water having a sufficient rise to give the required supply in the shaft sunk to within a few feet of the former.

When these works were just initiated several modifications of the type adopted were considered by the Department, and amongst these were:—

1. Brick-steining in lieu of slabbing. The objections to this proposal were based chiefly on the increased cost, and on the difficulty, which in some cases amounted to a practical impossibility, of obtaining labour and material for the purpose. A modification of this proposal was also considered, to stein the lower portion of the well in this way to protect the water from the effects of the timber slabbing, but it was not adopted, as a composite system would have been awkward on account of the change in the shape and dimensions of the shaft that would have been necessary. The cost and difficulties before alluded to were also at the time prohibitory.

2. The employment of masonry and of puddle for service tanks was also considered, but at the time framed timber lined with galvanized iron was adopted, as being more certain and better adapted for the purpose than either of the others. Stone is often far more difficult to procure than timber, and lime or cement becomes very expensive on account of the cost of carriage. Masonry service tanks are now being constructed in a few cases where timber is very scarce and stone procurable close to the work. Earthen puddle tanks require great care in their construction and in their maintenance; they should never be allowed to run dry, as if they do they soon begin to lose water; but where they are attached to wells where a constant supply of water is available to keep them full, they would, if attended to, prove more economical than either the framed or masonry tanks; and as their use would allow of a large storage at a small cost, wells having a weak but steady supply could in many cases be utilized. Iron-framed, buckled plate tanks are now being tried, and should prove more lasting and economical than any other type yet adopted.

3. The use of pumps in lieu of the primitive whim was also considered and abandoned, as at the time it would have been difficult to effect necessary repairs, and this might have caused great loss to stock dependent on watering-places where the pumping gear was out of order. The conditions surrounding these works have however altered so much since they were initiated that it is now well worth while considering whether water cannot be raised in a more economical manner than by the use of the whim, which under favourable conditions fails to utilize more than 50 per cent. of the horse power. The application of this power to pumping gear would give better results, and would not only be more economical in itself, but would very considerably lessen the cost of the shaft; for when double buckets were dispensed with the size could be very much reduced, lessening the outlay on both sinking and slabbing; the latter too would not be subjected to the same strains as with buckets working either on runners or with bumpers; strains, that in bad ground, especially running drifts, often lead to great expense for repairs and, in some cases, total abandonment of the work. The use of the horse as a motive agent, even when applied to improved gear, should however be avoided as much as possible, as in bad seasons there are elements of uncertainty attached to it, even as there are to its more economical rival wind. This agent has up to the present time not been tried by the Government on these works, and for the same reason that prevented it, years ago, adopting improved pumping gear; but the time has arrived when the primitive machinery of the past can be abandoned and more perfect appliances adopted, and in future works of this class, where the conditions are favourable, windmills and pumps will be provided instead of the whims now used for the purpose. Objections have been urged against the use of windmills for these works, on the ground that the wind might fail at the very time when a lot of travelling stock required water. This objection is perfectly valid; but the evil can be met by constructing larger service tanks, which, as there would always be water in them, might be made of puddled clay walls and bottom, which would without any increased cost provide a much larger surface storage to meet any sudden demand.

Before concluding these remarks on wells, it may be advisable to draw attention to the use that could in many cases be made of drainage shafts in localities in the dry districts where drifts are known to exist within from 10 to 20 feet of the surface, are also known to have a limited area and to be influenced by the local rainfall. In such cases the power of storage could be very much increased by sinking shafts to tap these drifts in places where the surface features favoured the collection of either standing or running water, which would then discharge down these shafts and be rapidly stored under favourable conditions as to temperature and evaporation, and at a depth from which it could be economically raised to the surface as required.

2. Tanks.

Most of the works for supplying the stock routes with water come under this head; and before describing the different types of tanks that have from time to time been adopted, it may be as well to give a short sketch of the conditions under which surface waters should be collected and conserved, and under which stock using these works should be supplied with water. In selecting a site for a tank the main points to be attended to are—that the area of the watershed will suffice, under the conditions of rainfall, to fill the tank and keep up the supply necessary to meet loss by soakage and evaporation and the demands made by stock traffic; that the nature of the surface of the shed allows of a sufficient proportion of the rainfall being available for storage, this being materially assisted by a proper system of gathering drains, by the fall of the country towards the tank, and by the consolidation of the surface by stock or otherwise; that the soil in which the tank is to be excavated is of a retentive nature; and in estimating this latter condition it must be borne in mind that many tanks which when first constructed lose water subsequently become thoroughly water-tight, this result being due to the deposit of clayey silt brought off the catchment by the rains. Advantage should if possible be taken of the features of the locality to provide for a storage of water above the surface of the ground. This course, when it can be carried out, materially lessens the cost of the work, as a much smaller amount of excavation will suffice than where the whole of the storage is below the natural service. This super-surface conservation may be effected either by gravitation or by pumping over the embankment enclosing the excavation. In the former case, which is of course the more preferable, there must be rising ground near the tank site, with a sufficient catchment above the level of the embankment to allow of the enclosed area of the tank being either wholly filled, or filled to a sufficient extent to warrant the expense of fluming. In the latter case the features, though not suitable for an over-bank discharge, must allow of a collection of water at the tank site which, after filling it to the same level through an inlet pipe, can then be pumped over the embankment into the tank.

When tanks are constructed in watercourses, the plan adopted by the Department is to make an embankment below the excavation; and in cases where the channel is shallow and the fall of the bed considerable, this dam is carried above the level of the creek banks, and flanking embankments carried on the same level as dam are continued up each side of the creek until they cut the natural surface of the ground. In other cases, where the fall of the bed is inconsiderable, a dam is constructed both above and below the excavation, and these if raised above the level of the creek banks are joined by lateral embankments; an inlet pipe is laid under the upper dam, which allows water to gravitate into the excavation and enclosed space until it reaches the level of the water outside; a valve is then closed, and if necessary the outside water is pumped over the embankment into the reservoir. This plan, while giving a greater depth of water, at the same time shuts off the tank supply from that in the shallow reach above it, and considerably reduces the loss by evaporation and soakage. In all works of this character great care must always be taken to provide an adequate by-wash, and wherever it is possible, the work should be located to allow of a natural channel being used for this purpose.

The system to be adopted in watering stock at these works involves two questions of great importance; that of the economical use of the water; and the preservation of its purity as far as is practically possible when it is gathered off what must be to a great extent a camping ground. It may be laid down as a broad principle that, to attain these ends, stock must not be allowed to water *in* the reservoir; for the amount of water carried away by sheep in their fleeces, the amount of silt carried by them into the tank, and the pollution of the water by all kinds of stock when drinking are all so great that no arguments are necessary to support this view; and it was fully recognized by the Department when the first works were constructed.

constructed. These tanks provided for independent watering, but subsequently many departures were made from the original design. These modifications, which will be presently described, were made to reduce the cost and to simplify the details as much as possible; the latter course being rendered all the more necessary on account of the heavy outlay that had to be incurred in repairing the older works which had been very inefficiently maintained.

The first departure made from the original design was to introduce a separate tank with flattish slopes for stock to water in; this being connected with the main tank by a pipe with a valve, so that the inflow of water to the drinking slopes could be regulated to the demand. The advantages claimed for this design are—economy in first cost, economy in maintenance, and simplicity of detail. The disadvantages, which overbalance the benefits, are thus set forth by Mr. Bruce, the Chief Inspector of Stock (report for 1880):—"That a great deal of the water, as now supplied from them, is liable to be polluted and carried away by the stock wading into it, especially by sheep; that they are liable to be crushed and injured in crowding down into the drinking-tank; and that the waste of water by evaporation is greatly increased by its being allowed to run into and stand in the drinking-tank." Mr. Bruce might have added too, that the inlet pipe from the main tank to the drinking-tank is very liable to be silted up and rendered inoperative.

On the Cobar to Nyngen Road the tanks are simple open excavations, in which all stock water direct. This is undoubtedly the simplest, and, in first cost, the cheapest form, but it is open to the objections previously urged as to waste and pollution of water, the latter too in an aggravated form which is very marked when the water is low. These tanks were constructed to meet the urgent wants of the Cobar township and mine, and to secure the trade from that important district for the Sydney market.

The last type of tank to be noticed is that adopted in the Bourke district, which, with a separate drinking slope, has an *open* communication with the main reservoir, through a box drain. This plan nullifies any advantages that might be claimed for the separate drinking-tank system as already described, and aggravates all the objections to it, reducing it in fact to a level with the open single excavations on the Cobar to Nyngen Road, with the added disadvantages, that the first cost—for equal contents—is greater, and the exposed areas for soakage and evaporation much increased.

The experience gained in carrying out these works has led to the conclusion that the system first adopted is that which, considering the greater facilities that now exist for obtaining skilled labour, and for transporting and repairing the necessary plant, should be adopted in all future works; and type drawings have been prepared which, while showing some alterations in detail, embody the same principles that were followed in the first works of this class carried out by the Department.

The main alteration in the details of construction is the employment of pumping gear in lieu of the M'Comas water lift. This avoids the necessity for a lot of submerged timber-work, which, in addition to being very expensive, is always an element of weakness; it also lessens much of the annoyance and inconvenience due to silting, which chokes the M'Comas lift but is avoided with our pumping appliances, by a floating suction pipe. Another alteration is the construction of a service tank to supply the troughing instead of connecting it direct with the pump. This gives stock a much steadier supply when they are watering, and provides a reserve to meet any sudden demand when the pumps are under repair.

The use of pumps for increasing the storage by lifting water over the embankments, in cases where it collects outside the works, has been considered and approved, but the power to be employed has not been determined. In all cases where the conditions are favourable windmills should be employed; and in forming an opinion on this point it must be remembered that, as they are slower and more uncertain in their action than steam, they can only be advantageously used for feeding the main tank when there is a considerable collection of water outside the embankments. When this is not the case, more rapid pumping will be necessary, and then steam should be employed if fuel is procurable within a reasonable distance. Pumping appliances should be erected at each work, and used for filling the service tank, in addition to pumping water over the embankments for storage. This course is preferable to having a portable engine and centrifugal doing duty at the tanks along one or more lines; for in many instances fuel would be too distant from the sites to be economically used; the stages would be too long, and the delay as between one tank and another would mean the loss of the outside water, which if it collected in sufficient quantities to admit of such delay, should be pumped into the tank by wind-power.

Windmills, though they have not received much attention, and have been but little used in those districts, are destined to be extensively employed in lifting water both for stock and irrigation. When it is considered that there are very few days in the year during which good work could not be obtained from a well constructed mill—that the first cost is comparatively small—and that the after cost for work done is confined to the expenses for maintenance—it seems very strange that attempts have not been more generally made to utilize this power. When its value has been practically tested and the results are presented in a tangible form, there is little doubt but that it will be extensively used by all who are interested in the adoption of a cheap means of raising water, whether from wells or tanks, whether for stock watering or irrigation purposes.

Great difficulties are often experienced in letting these works, more particularly during dry seasons, when the want of water and feed within a reasonable distance of the tank site render it absolutely impossible to carry them out; and in other cases, somewhat less unfavourable, has increased the cost of excavation from 30 to 40 per cent. above the price for which it could have been done in good seasons. This is the necessary consequence of employing animal power in ploughing and scooping—though this system has very much reduced the cost of excavating and has almost entirely superseded manual labour. Attention has consequently been directed to steam power, and Fowler's ploughing and scooping plant has been successfully used for some time in South Australia. More recently the Messrs. Edols at Burrawang purchased and worked a similar plant on their property, where I saw it in operation in May last. The following extracts from my report to the Department explain, from my point of view, the relative advantages of steam and animal power under varying conditions:—

"This plant consists of two 16-h.p. traction engines, with horizontal winding drums for working a double three-furrow balance plough and an earth scoop. There is also an 8-h.p. traction engine for drawing water and firewood, and for assisting the main plant when travelling from one side to another. The cost of this on the station was about £5,000.

"The advantages claimed for this machine are—

"1. That it is independent of the seasons, and able to work under conditions that would prohibit the use of bullocks or horses.

"2. That it is much quicker and more economical than animal power.

"3. That it is easily transported from one locality to another, and through country where bullocks would die for want of water and grass.

"In practice I think it will be found that these advantages are not fully realized, and that there are very important modifying influences to be considered.

"1. Though it can work under conditions that would prohibit the use of bullocks or horses, it is not fully independent of the seasons, inasmuch as it consumes about 1,800 gallons of water per diem, which is equivalent to what would be consumed by about 120 bullocks. Herbage or grass is of course not needed, and so far this plant is independent and is in a position to do work where animal power could not be applied; but firewood and water are as necessary for the engines as are grass and water for bullocks; and where these requisites are scarce, and have to be hauled from any considerable distance, the limit for the application of this machinery is very soon reached. In favourable country for running the traction engine I consider, from what I saw at Burrawang, that 20 miles would be about the limiting distance for haulage of wood and water; but in unfavourable country, that is, where the ground was loose and sandy or where it was boggy, the limiting distance would be much reduced, for in such ground the traction engine is unable to work, or works under such difficulties that its normal efficiency would be very much lessened.

"2. The claim for superior speed and economy can only be partially sustained. In bad seasons, when animal power could not be applied on account of there being no feed, and in places where firewood and water were within a reasonable distance by a sound track, the steam plant commands the situation; but in good seasons the work could be more rapidly carried out by bullock plants if the same capital was invested in them, but not at the same price, though even on this score there is not much to be advanced in favour of the steam plant, as will be seen by reference to the following figures showing the cost of excavations by both systems:—

"Cost of steam plant £5,000

Weekly

Weekly expenses—				
1 engineer and manager	@ 80/ =	£4	0	0
3 drivers	@ 30/ =	4	10	0
1 steersman	@ 25/ =	1	15	0
1 scoopman	@ 30/ =	1	10	0
1 clearer (for rope)	@ 25/ =	1	5	0
2 woodcutters	@ 20/ =	2	0	0
1 cook	@ 20/ =	1	0	0
10 rations	@ 12/ =	6	0	0
Oil, &c.		0	10	0
Interest @ 8 per cent.		8	0	0
Depreciation @ 12 per cent.		12	0	0
Total		£42	0	0

"The work done in a week is equivalent to about 2,500 cubic yards, which makes the cost 4d. per cubic yard.

"This estimate of cost is based on the supposition that there are no stoppages, and that there is no delay between one tank and another; but, as a matter of fact, there are many stoppages and much delay in transporting plant. This latter element of loss increases to a great extent in sandy country or in wet seasons, when the bullock plant is most favourably circumstanced. Taking these disturbing elements into consideration, we must fix the price of the work done at a much higher rate. I estimate that only thirty-four weeks in each year can be relied on for work, the balance being required to cover the various unavoidable delays. This affects the estimate of cost to a considerable extent; for with a plant of this character, requiring trained men to work it, no reduction can be made in the weekly expenses during the time it is idle; consequently we have fifty-two weeks' wages, &c., at £42, representing thirty-four weeks' work at 2,500 cubic yards a week, or 85,000 cubic yards, costing £2,184, being at the rate of 6d. per cubic yard.

"Cost of bullock plant				£1,300
Weekly expenses—				
1 manager	@ 60/ =	£3	0	0
5 bullock-drivers	@ 30/ =	7	10	0
2 ploughmen	@ 30/ =	3	0	0
5 scoopmen	@ 30/ =	7	10	0
1 tailer	@ 25/ =	1	5	0
1 cook	@ 30/ =	1	10	0
15 rations	@ 12/ =	9	0	0
Interest @ 8 per cent.		2	0	0
Depreciation @ 10 per cent.		2	10	0
Total		£37	5	0

"A strong plant like this could excavate about 1,500 cubic yards in a week, which would cost 6d. per cubic yard.

"This estimate, like that for the steam plant, requires modification, as the bullocks could not, for various reasons, be constantly worked. Estimating the same loss of time, which taking the average run of the seasons is I think, equitable, and we have—

34 weeks' work	@ £37 5 0 =	£1,266	10	0
18 weeks' idle time	@ £18 0 0 =	324	0	0
		£1,590	10	0

"This amount represents thirty-four weeks at 1,500 cubic yards a week, or 51,000 cubic yards, and the cost per yard is about 7¼d.

"From this it will be seen that the same amount of capital invested in bullock plant would give a much larger output while at work, but at an increased cost of 1½d. per cubic yard. Could the seasons be relied on, there is little doubt that animal power would be preferable to this form of steam plant, as the extra cost by bullocks is fairly balanced by the risk of breaking down, &c., which in the out of the way places where this machinery would be employed, would entail great loss of time and money, and very soon cover the small margin of difference in favour of steam.

"When, during long continued droughts, it is impossible to employ animal power, and when water and fuel are available for steam, then this plant comes to the front and offers the only practical means of tank excavation."

Another excavating machine, invented by Mr. Waugh, is now at work near Sydney; and though it does not avoid the necessity for employing horses and drays to remove the material, promises to very greatly reduce the cost of "getting." It has the advantage of being less cumbersome than the ploughing and scooping machinery, is much less costly, but is far more limited in its application. The patentee is perfecting the machine, which, being constructed on a new principle, has naturally exhibited some defects. When these are remedied, it promises to be a valuable addition to the resources at our command for reducing the cost of excavation either in tanks or canals.

II.—Water Supply for Irrigation.

There are few questions of such importance, few questions with which the future prosperity of this Colony is so intimately interwoven as that of irrigation; and considering the extent to which works of this character will promote settlement and mitigate the uncertainties that now attend both pastoral and agricultural occupation, it seems strange that no steps have been taken to ascertain to what extent and at what cost the rainfall of this Colony can be conserved and distributed over the waterless areas of our western sheds, where a rich soil, now lying fallow, only waits its invigorating influence to yield returns, that, with the climate we possess, would convert it into a mine of wealth. Surveys that will require years to complete, and that are essentially necessary to assist in framing a comprehensive scheme, are not even commenced, and the time must be far distant when we shall be able to lay claim to having taken the first great step towards developing the wonderful resources of our lands. It cannot be said that attention has not been drawn to the advantages to be derived from such works, for seventeen years ago, when giving evidence before the Board appointed to inquire into the Moama and Deniliquin railway scheme, Mr. W. C. Bennett, Commissioner and Chief Engineer for Roads, drew attention to the yearly waste of water brought down by our western rivers, and the practicability of employing it for irrigation purposes. The Commissioners appointed to inquire into a water supply for Sydney and suburbs, in their report thus allude to the subject:—"Although our commission limits us to an inquiry into the supply of Sydney and suburbs, we have not been unmindful of the great desirability of obtaining such a plentiful command of water as would permit of its free use in irrigation; not only in the immediate neighbourhood of Sydney, but also over some considerable portion of the county of Cumberland. We feel convinced that this question of irrigation ought no longer to be neglected. Our comparatively dry climate, coupled with the very unequal and uneven distribution of rainfall, point imperatively to the necessity for making provision for storing up the superabundance of rain that occasionally falls, that it may afterwards be dispersed to the thirsty soil as required, and thus secure fertility and plenty in all seasons." Time after time have letters and leading articles appeared in the public journals drawing attention to what has been done and gained by such works in other countries, and showing the necessity of action if we intend to avail ourselves of the latent wealth at our feet; but in even plainer language and with practical force has Nature herself indicated what water can do in the dry districts, and how readily, if conserved and at our disposal, it can be distributed over the face of the country. In proof of this I instance the spread of the flood-waters of the Murrumbidgee, Lachlan, and Darling, in 1871; the net work of connections between the Bogan, the Macquarie, and the Castlereagh Rivers, in the counties of Clyde, Leichhardt, Gregory, &c.; the water circulation in North Gipps, which, with many other instances, point in no unmeaning manner to the facilities offered by the natural features of the country for distributing the supply brought down by our rivers, and for pouring living streams of water over the thirsty plains. Yet notwithstanding all this, season after season as it rolls by shows us our rivers, fed from the higher lands by the greater rainfall, by melting snows and by springs, carrying

carrying the life-blood of the country through the very districts where its fertilizing agency is a necessity to success, to discharge it to waste in the ocean; while those who have eyes to see, and *must* see the incalculable advantages that would accrue from utilizing it, look on and abuse Nature rather than exert the powers they possess and assist her to assist them.

The conditions surrounding this problem in this country are widely different to those which had to be dealt with in India and Southern Europe; there a teeming population made it necessary that increased and certain returns should be obtained from the soil, and there as soon as the facilities for obtaining water were afforded they were immediately taken advantage of, and thus, both by direct and indirect returns, enterprise in this direction was encouraged. In the former country, though much remains to be done, it is almost impossible to over-estimate the blessings that irrigation works have conferred on the people, improving both physical and moral tone, and to a great extent mitigating the evils that in a densely populated country attend the failure of the crops that form the great staple of life. In this country, instead of having a large population settled on the soil requiring the assistance offered by such works to meet their wants, we have an immense territory possessing a soil capable of growing any products suited to the climate, which is now little better than a huge sheep-walk, but which is capable of being converted into great agricultural districts capable of supporting thousands where now it is difficult to count tens. This paucity of population has been urged as an argument against such works being undertaken, the inference being that population must precede irrigation. This means that irrigation will never be carried out on the great western plains, for I maintain that in the Riverina districts irrigation works must precede settlement, that is, settlement on any but a pastoral basis. To those acquainted with these districts this must be obvious, for without water agriculture is impossible, and except in certain confined and favoured localities, it is impossible for irrigation to be applied to any agricultural holding by ordinary private enterprise. The pastoral tenant—the sheep farmer—can provide all the water he requires for his flocks by local conservation in tanks and wells; but the large quantities of water required for crops cannot be locally conserved in the flat country, while to obtain it from distant sources means an expenditure of capital far beyond the abilities of any agriculturist, and far in excess of any returns that could possibly obtain from individual holdings. Maintaining these views, I fail to see how the hopes entertained as to settlement on a large scale, following on the liberal railway policy pursued in these districts, can possibly be realized; I fail to see how, unless water is at our command, the lines constructed, being constructed, and those proposed, more particularly the latter, can ever carry much besides pastoral produce. Whether railways through these districts will pay under such conditions remains to be proved; but that they would do so were a population settled on the country, actively engaged in cultivating the soil, does not admit of a doubt, any more than does the fact that, taken in connection with a water supply, they would have an important bearing on settlement in such improved districts, by the facilities they would give for distributing produce grown in those districts.

Believing as I do, that in those districts the construction of the main channels for distributing water must precede settlement, it follows, that for some time after their construction they will have a more important bearing on pastoral than on agricultural occupation; and though, even from this narrowed view of the question, they will be of immense importance, it cannot be expected that they will prove remunerative until they are utilized for the more comprehensive objects for which they were constructed. The advantages to be derived from such works by the sheep-farmer are manifold, and in themselves well worth consideration. Prominent amongst these are—the direct facilities that would be afforded for watering stock by giving new frontages along the arterial channels, while the benefits from this source could be much increased by cutting distributing channels to feed tanks off the main lines, and by turning surplus waters into the many natural hollows existing in those districts. A great saving of feed would result from this, by allowing of a more equable distribution of stock and by lessening the distances they would have to travel between feed and water. Such channels would also aid in keeping communication open in all seasons, and thus allow, should occasion arise, of the transfer of stock from less to more favoured districts, and materially lessen the enormous losses to which pastoralists are liable during droughts. Nor must it be forgotten that these channels would in their districts afford the means of mitigating to a greater or lesser extent the evils attending droughts, by the facilities they would give for growing artificial crops, which being stored during good seasons would materially assist in meeting the wants of stock during bad seasons.

One of the first steps to be taken, or that, judging by the benefits that are likely to be derived from a comparatively small expenditure, should be taken, is to assist Nature where she has defined the course of the waters during flood-times, and improve the *régime* of the overflow channels from our rivers, such as the Merowie, Middle Billabong, and Willandra from the Lachlan; the numerous creeks leading from the Macquarie to the Bogan; the various channels forming a natural system of distribution in North Gipps; and many other cases, all of which are capable of being made of immense service to their respective districts. These watercourses should be straightened and improved, so as to admit of an inflow at a lower flood-level, and to allow of a larger body of water being carried down them during the comparatively short periods when the rivers afford a gravitation supply: these periods should also be lengthened by the construction of weirs. Branch channels should be cut to divert flood-waters from the rivers and overflows into the numerous lakes, swamps, and natural depressions found in those districts, which could in many cases be utilized, not only for the benefit of the adjoining lands, but also as reservoirs to make good the loss from various causes in the overflows, &c. The advisability of carrying out this latter work would of course be greatly dependent on the advantages to be derived as compared with the cost of cutting the feeders; but as these could be utilized along their courses, the distances of these natural reservoirs from the point of diversion becomes a matter of less importance. Sluices would necessarily be required to regulate the waters and to prevent a back flow when the rivers fell. Private efforts have been made in some few instances to attain these ends; inlets have been cut from the rivers to these secondary channels, which, generally speaking, are more imperfectly defined where they leave the rivers than they are further on in their course; but most of these efforts have failed to fully realize the expectations of the promoters—failed because, though admitting the river waters at a lower level, the channels below the inlet improvements were left unaltered, and only capable of carrying the water forward at the velocity due to their natural *régime*, this velocity being very small, on account of the sinuous course of these creeks through a comparatively level district giving a much lesser fall than that of the country on the general direction of flow. Much could be done in this direction by judiciously planned works—done, too, with a very moderate outlay; and though these improvements would have a limited application to irrigation, they would yet assist in that direction and would be of immense benefit to the pastoral industry, and would greatly increase the value of the Crown Lands and the rents that ought to be derived from them; and when, later on, they were connected with a more perfect scheme, they would be as valuable to the agriculturist as in their earlier stages they were to the sheep-farmer.

The important bearing of these channels, &c., on the water supply for the districts they intersect points to the urgent necessity that exists for taking prompt measures to reserve from sale all lands adjacent to them, that, under normal conditions, can only be utilized for grazing, but that would be valuable for agricultural purposes when provided with a certain water supply. This course should also be adopted under similar conditions of settlement on all belts of country where, without survey, there is sufficient reason to think they can be brought within the scope of any general scheme of irrigation. This course will be necessary to prevent the improved areas, or the areas proposed for improvement, being alienated for purely pastoral purposes, and to ensure that the Colony generally shall reap the full advantage of the increased value of these lands—an increased value that should be credited to these works, and which, while recouping the country for a considerable proportion of the outlay, would at the same time practically prohibit these areas being devoted purely to grazing. The increased cost of such land would also have the effect of making the holder more rapidly develop its capabilities, and would ensure every advantage being taken of the irrigation works, without which the cultivator could not rely upon a return for his labour and capital, and without which these works could not be expected to prove remunerative.

In considering this question from a general point of view, it must be borne in mind that as the features of the country to be dealt with vary, so may there be room for an equal variation in the nature of the works best adapted for the object to be attained; and it will therefore be advisable to divide the subject into two main branches, dealing separately with irrigation derived from local sources, and with that derived from our great rivers; not forgetting that many cases may arise where the supply obtained from the former could be largely aided by the latter, and *vice versa*.

The country to be dealt with consists in the west and south-west of extensive plains, broken here and there by sand-hills and low ranges, and with a small fall in the direction of drainage, but nearly level transversely to such lines, except where watercourses and ridges are intersected. To the eastward the ranges become more frequent, and of greater magnitude, gradually culminating in the coast range which divides the eastern and western watersheds. The rivers and their earlier tributaries have a considerable fall in their upper courses, but this gradually diminishes as they run westerly, till in the plain country it does not much exceed 4 inches in the mile, but as the bends give a river length roughly estimated as being three times greater than that of a direct line, the fall of the country would be about 12 inches per mile.

The

The rainfall over these districts varies very much, being dependent to a great extent on the features of the country and on position in regard to the main coast range, where the fall is heaviest. From this range there is, with some slight local irregularities, a marked decrease of the rainfall as we advance westwards. The nature of the rainfall is not only spasmodic in its annual amount, but is equally fitfully distributed over each year. This has an important bearing on the proportion that is converted into running water and that can be conserved for future use, as also on the loss by evaporation; this must be greatest on the low-lying western plains, where the ground has a high temperature and the winds are very dry and act very continuously. The loss from this cause must attain its maximum when the annual fall is so distributed that the minimum of running water is formed, when, consequently, there is no concentration of rainfall off large areas to reduce the evaporation surface, and to further lessen loss by the difference in the rate of evaporation off a water surface as compared with that off the soil. In such cases I can readily understand that, were the supply kept up under equally favourable conditions for the whole year, we would have fully 20 feet to record as the result. But unfortunately we have no data on this point, any more than we have as to the proportion of this evaporation that may be given back by condensation in other form than that of rain. But although these data are not at our command, and as it is consequently impossible to arrive at definite conclusions as to the exact number of inches, we must take the measure of evaporation in different localities; and although we admit that where light recurrent rains fall on a baked and heated ground surface, and are exposed to hot and thirsty winds, the evaporation must be enormous, I yet think we are justified in taking more hopeful views as to the possibilities of irrigation than has been done by those writers who have *lately* made a bugbear of the evaporation question, and have tried to prove that it must render any irrigation scheme impracticable. It cannot be denied that in the eastern and hill districts of this watershed the rainfall is greatest, and evaporation much less than on the plains; that the incline of the country favours a rapid concentration of rainfall, giving water surfaces of limited area for evaporative agencies to act on. In these districts the rainfall must be impounded for after distribution through artificial channels; and while so concentrated, the loss by evaporation need not trouble us here much more than it does in other dry countries, save that we have not as copious and constant a supply to draw on as other countries have had for their irrigation schemes; but when concentration ends, and the water is discharged over the surface to be irrigated, then the loss from this cause will be heavy; but it still remains to be proved whether a 2-inch watering, even admitting the rapid loss, will not produce as great a vegetable growth with the forcing climate of our plains as the same amount of water where the heat and evaporation are less, and where the water remains longer in the soil. Judging by the wonderful effects produced by even half an inch of rainfall in the same country, it appears probable that the rapid loss by evaporation is in a measure made up to us by the equally rapid growth of vegetation. Should this view be incorrect, is the loss through evaporation so *much* in excess of what it is in other dry countries that we should at once despair? I think not. The loss from a water surface in Bombay has been estimated at about 6 ft. per annum; in this Colony, at Bourke, Mr. H. C. Russell estimates the evaporation at about 7 ft. Presumably the evaporation off the soil, as compared with that off water, will bear the same proportion to one another in both countries, in which case our position is very little more unfavourable than is that of India, where irrigation has been carried out on a large and most successful scale.

From the foregoing it will be seen that there are two classes of country for us to deal with: that on the middle levels, where the rainfall is, taking an average of years, fairly abundant, where the evaporation is not very great, and where the slope of the country is sufficiently marked to convert a large proportion of the rainfall into running water, which under normal conditions is rapidly carried away by creeks and rivers. The other class is on the level lowlands, where there is a minimum of rainfall, a maximum of evaporation, and so little incline, that under ordinary conditions of rainfall but little running water is formed.

Local conservation of rainfall for irrigation purposes can only be adopted in the hill country, where the natural features offer facilities for storage. The works for this purpose, which in India are called tanks, have been largely used in that country from time immemorial, and great benefits have been and are still being derived from improvements of this class. In the Madras Presidency, in 1853, there were, according to Captn. R. Baird Smith, no less than 43,000 tanks in use, and 10,000 more which had been allowed to get out of repair and were of no service. In forming an opinion of the amount of work involved in the construction of these reservoirs, it must be remembered that the work "*tank*" has a much broader significance in India than it has in this country, where they are little else than excavations, few of which contain more than 20,000 cubic yards; *there*, tanks are large reservoirs conserving enormous bodies of comparatively shallow water, which is impounded by embankments. The Ponairy tank in Trinchinopoli covers an area of about 80 square miles, the embankments being 30 miles in length; while the Veranum tank has an area of 35 square miles, and embankments 12 miles long. Similar works could be constructed in this Colony, and a large proportion of the rainfall locally conserved and distributed. Dams could be thrown across valleys and basins, and, where the drainage from the watersheds naturally feeding these reservoirs was insufficient, channels could be cut to bring an extra supply from some adjacent shed, or, in many instances, could be made to divert the flood-waters from neighbouring creeks or rivers. By such means as these the evil effects of our spasmodic rainfall could be mitigated in the improved districts, and isolated areas of rich land made permanently reproductive and independent of the seasons in localities which could not be brought within the scope of a general scheme, either on account of the levels being unfavourable, or on account of much valueless land having to be traversed by the canals before the district to be irrigated could be reached. In such cases the cost of bringing water from a distance might be prohibitory, and then the only courses open would be to take advantage of local supply, to trust to the seasons, or to abandon the ground for agricultural purposes. The first of these alternatives can only be successfully followed when the rainfall and catchment area are sufficient to provide the necessary supply, and when the natural features offer facilities for storage and distribution at a cost that will allow of the water being made commercially reproductive; the second alternative of trusting to the seasons seems to be born of the happy-go-lucky style of farming so general in this country, and which, unless in particularly favoured districts, or in favourable seasons, is as general in its failure as in its adoption. The last is often the natural sequence of the second alternative, and in far too many cases for the interest of the community has this been the result of undertaking agriculture under conditions that without artificial regulation are too unfavourable to allow of success; the consequence being that these lands, rich though they may be, revert to the Crown, or are absorbed into some large pastoral estate, the selector and would-be farmer having wasted not only his small capital but some years of labour which could have been more beneficially employed in other channels. Amongst the many advantages to be derived from *local* conservation, is the fact that there need be no such delay in providing the necessary supply as would be the case if the lands to be dealt with had to wait until they could be brought within the scope of a general scheme; and this advantage is increased by the fact that such works could be undertaken by district Boards, whereas the larger and more comprehensive scheme, being national in its aspect, would have to be dealt with by the central authorities. The important bearing of such local works on the welfare of the country is very forcibly shown by the concluding remarks in Captain Smith's report on irrigation in the Madras Provinces. He says: "I cannot close my report without reverting for a moment to the field of improvement presented by the Presidency of Madras in the single department of irrigation. In all parts of India, profit to the State and the people follows, as certainly as effect follows cause, the provision of an abundant supply of water for agricultural purposes, but in Madras the results go far beyond the general average. The staple of agriculture in the irrigated districts being rice, the want of water brings with it abject poverty and discontent, its abundance wealth and contentment. Every acre that is newly watered passes at once from the revenue rate of dry, to that of wet cultivation, guaranteeing to the Government an immediate return, paid with far greater ease to the cultivator of the land than the lower tax leviable before. The return is immediate, and its amount great. I have almost hesitated in adopting the data given by the Madras Commissioners of Public Works, so extravagantly large do they appear; but they are statements founded on official returns, open to verification, and unlikely to be seriously in error. When these show returns varying from 77 to a maximum of 259 per cent. on the original cost of the works, it is inconceivable that fields parallelled only, if parallelled at all, by those of Australia and California, can be left much longer unwrought."

This description, however true it may have been in its application to the districts alluded to at the time it was written, is scarcely parallel with the conditions surrounding the question in this Colony; but after making every allowance for sparse population, high priced labour, and distant markets, there is much still left to excite hope and sustain the belief that the time has arrived when irrigation works should be initiated; and that in the years that must elapse in carrying them into complete effect, settlement will be borne steadily forward on the living streams distributed through the thirsty land; successful settlement developing the latent wealth of the Colony and ensuring a grand future of peace and prosperity.

The local conservation we have been considering, though it must have a great influence on the advancement of agriculture, is secondary its extent and importance to the supply offered by our river systems, on which we will have to depend for irrigation in the low country, or for providing water for any comprehensive scheme; and sooner or later active steps will have to be taken to draw these waters into our service, and to utilize them so that they will lessen the loss and misery attending droughts in the pastoral districts, increase the stock-carrying capacity of the country, and develop the extraordinary but latent

latent agricultural resources of districts where an unrivalled soil and climate will yield abundant returns to reward our enterprise. To attain these desirable ends water and population are necessary. The former we possess, and it only needs capital and skill to divert it into channels where it will be at our command, a potent power in the advancement of the Colony, instead of being carried wastefully to the ocean, a practical satire on our plaints and prayers: the latter—population—must, as far as the dry districts are concerned, follow, not precede, such works; and there is little doubt that when water is obtainable for irrigation, agricultural settlement will certainly follow, more particularly as the preliminary cost of preparing the surface will be much less than what it is in many other countries, both on account of its natural evenness and on account of the small quantity of timber to be dealt with.

The few attempts at irrigation that have been made in the Riverine district have been conducted under great disadvantages, as the water has been pumped from a low level, and the cost consequently increased to a very great extent. Notwithstanding this great drawback the results have been very satisfactory, and point in a most unmistakable manner to the benefits that must be derived from the construction of works that will deliver the required supply by gravitation. The following extracts from a letter kindly written by a gentleman who is intimately connected with one of the largest pastoral properties on the Murrumbidgee, need little comment, except to draw attention to the fact that the water was raised by steam power, and that the cost of irrigation on which the writer's opinions are based was much in excess of what it would have been under a properly carried out scheme delivering the water by gravitation, and also much in excess of what it would have been with steam pumping, had there been weirs to raise the water level and reduce the lift. This gentleman writes as follows:—"Some years ago I ploughed up about 10 acres near a lagoon on this station and sowed a portion in lucerne, a portion in prairie grass, a portion in maize, and a portion in oats.

"The soil, although rich enough, is rather stiff and clayey, and it was very imperfectly broken up when the seeds were sown; the consequence being that the crops came up very unevenly, but all the plants that did come up grew very luxuriantly.

"I irrigated the patch by pumping the water by means of a 12-inch centrifugal pump, and a 12-horse power engine from the lagoon into a raised channel carried round the higher side of the land; from which channel the water was allowed to overflow, by making breaches at intervals in the bank, spreading itself about until all the land was saturated. The ground is almost a dead level, so that there was little difficulty in distributing the water over the surface.

"I watered it about five times during the summer months, giving it on each occasion a soaking which I should think equal to 2 inches of rain or thereabouts.

"The maize crop grew well to a height of 8 or 10 feet, and the cobs of corn were of good size, but I kept no record of the quantity gathered. The lucerne and prairie grass were fed down with sheep, and the oat crop, a very fine one, was cut down for hay. The lucerne is still growing and thrives well. The prairie grass died out last summer, when I did not irrigate it.

"The primary object of my experiment was attained in satisfying me that crops of all ordinary kinds suited to the climate can be grown in great abundance in this district by means of irrigation, but I could not pretend to give anything like an accurate estimate of the cost per acre of laying down and watering, or to speak with anything like authority as to the profitableness or otherwise of the work.

"I am inclined to think that ordinary agricultural products of a compact and easily transportable kind, such as flour, would be more cheaply purchased elsewhere, and brought down by rail, than grown here under irrigation, but that irrigation might be profitably used for producing hay, which is bulky, and consequently expensive of carriage; or for raising potatoes or roots, which are perishable, or green stuff to feed valuable stock on in time of drought.

"I think also that wine-growing might be profitably carried on under irrigation, as vines thrive very vigorously here when liberally watered, and produce grapes of great richness and flavour.

"One thing I may mention which may appear somewhat incredible to people who have seen the Murrumbidgee River only in time of flood, viz., that I think the supply of water in the summer-time would sometimes be found inadequate to very extensive irrigating operations.

"The stream is frequently, from January to March, so shallow that a horse may ford it without wetting his knees, and of no great width; and from the quantity of water I have myself pumped up with one engine and pump for irrigating and sheep-washing purposes, I feel sure that if 500 or 1,000 other people were each withdrawing a similar quantity of water from the river the stream would be found insufficient.

"This drawback could of course be obviated by the construction of weirs to impound large quantities of water in the channel, and prevent it from running to waste; but this work would probably be found too expensive to be undertaken until the country becomes very much more thickly peopled than it is likely to be for many years yet."

From the foregoing extracts it will be seen that the writer only tried and only formed an opinion on the profitableness of irrigation from the results obtained with the everyday agricultural products of the Colony; but, great as would be the advantages of extending the cultivation of such products into the dry districts, they would be insignificant when compared with the returns that would be obtained from the more profitable cultivation of plants that are more particularly adapted to the Riverine climate, such as indigo, madder, chardon, hemp, limes, olives, &c.

The concluding paragraphs of the letter have an important bearing on the question; and, before proceeding further, it may be well to consider the nature of the rivers from which our supply must be drawn, and the conditions under which water can be stored and diverted for distribution. As has been previously remarked, the fall of the rivers, which is very slight in the lowlands, increases considerably as we trace them towards their sources. Another feature is, that where they have the greater fall they run through deep and comparatively narrow valleys, bounded by ranges of considerable abruptness, and generally of a rocky, barren character; that when the fall is slight there they run in deep-seated beds through a plain country, over which the waters spread for very considerable distances during floods. The quantity of water brought down by these rains is, on account of the spasmodic nature of the rainfall, very variable; some seasons give a full river for months at a time, while there are equally long periods during which the flow is insignificant. To meet these variations and to equalize the supply that must be provided for irrigation, impounding works are the first necessity, and there is little room for doubt that this must be carried out, not only in the comparatively level reaches of the rivers, but more particularly in the middle and upper courses of the main channels and their tributaries. Many of those who have interested themselves in the question consider that weirs in the lower courses of these rivers, impounding water on the frontages of the lands to be irrigated, will meet the requirements of the case; but a little consideration will show that any such limited supply would be quite inadequate for any broad irrigation scheme, and that the cost of the works to carry such a plan into effect would be out of proportion to the benefits derivable from it.

The quantity of water annually required may be estimated at 12 inches, being six waterings of 2 inches each. This amounts to 43,560 cubic feet per acre. Assuming the river to have an average width of 150 feet, and that the depth maintained was 20 feet, this would give a storage of 15,840,000 cubic feet per mile of river channel, and would provide for the irrigation of 360 acres, or a strip of land on each side of the river about a quarter of a mile in width. It may be said that no account has been taken of the occasional supply brought down, and which would refill the ponds; but as there *are* seasons when no such supply could be relied on, and as irrigation to be successful must be certain, I have left this out in my estimate. The expense of constructing weirs and, on our navigable rivers, locks, for maintaining traffic, would be out of all proportion to the advantages derived, for even then the water would have to be raised by steam or wind power. The construction of weirs in the alluvial country characterizing the lower reaches of the western rivers of this Colony would be a very costly undertaking, on account of the difficulties that would be experienced in protecting such works from scour. Exceptional cases might arise where rocky bars would be found crossing the rivers, on which such works could be securely founded, but these cases would be few and far between, and can almost be neglected in considering the subject. It may possibly be urged, as against the objections now raised, that the expense of constructing such works could not be charged in its entirety to the irrigation funds, inasmuch as with locks in connection with the weirs permanent navigation would be established, and this should be debited with a portion of the outlay. This, however, cuts both ways, as it reduces the quantity of water at disposal for irrigation by the depth that would have to be maintained for navigation; but, apart from this, it is worth consideration whether, if such improvements are ever considered advisable, lateral canals would not be found preferable to improving the existing channels, with their tortuous courses; with the large supply of water required to provide for their unnecessary length and width; and with the constant difficulty of maintaining such works in flood-time. Taking all these points into consideration, such a system for irrigation supply must be discarded, though, *in connection* with the impounding operations that should be carried out in the upper reaches, weirs might be of modified use on the lower levels for assisting in the diversion and storage of water.

The great object to be attained is to provide a steady, certain supply that can be distributed by gravitation, and to compass this a sufficient body of water must be stored in the upper courses of the main rivers and their tributaries to provide

a supply during the season of least rainfall, when the natural flow would be insufficient; and, having made this provision, to construct canals to receive and carry into the dry districts the water so stored. The upper and middle, or upper-middle courses of the rivers to be dealt with, are far more favourably circumstanced for economical storage and diversion works than they are on the levels; for the fall, though not too great to allow of moderate impounding works throwing back the water to a great distance, is yet sufficient to allow of the water being readily diverted from the natural channels into artificial canals excavated for the purpose. The valleys through which these rivers pass are in many places very much contracted, the waters running through narrow gorges which open out above into large basins. These sites offer favourable opportunities for constructing weirs, the foundations on these sections of our rivers being of a sound character, and no difficulties likely to arise from the flanking action of scour. Enormous bodies of water could be stored in such places without any disproportionate expense being incurred, and in some cases with a very small outlay. The tributaries to these rivers would have to be similarly dealt with, means being provided in each case to allow the impounded waters to be discharged as required, so that any surplus over what would be needed for merely local wants could be passed down to supply the lower ponds where the water was being drawn off by the main canals, and those ponds still lower down where, either by steam or wind, water was being raised for irrigation along the rivers.

The preceding remarks are necessarily of a merely general character, for the data at our command are of such a very meagre nature that it is a matter of impossibilty to formulate any scheme. Before this can be done, careful observations must be made of the discharge of our rivers at different points, and extensive and accurate surveys prepared, showing the quantity of water we can command and the cost of the works for conserving and distributing it. Until this is done, any views on this question must be vague and ill-defined; but we know enough of the conditions under which irrigation will have to be carried out in this country, and under which it has been carried out in other countries, to enable us to take a practical view of the question as a whole; enough to protect us from being carried away by the mad enthusiasm which pictures the whole of the dry country converted into a garden of Eden, and at the same time protect us from the baneful workings of those who handle our rainfall and evaporation as weapons of attack with which to rout those who earnestly desire to see this country benefited by a wise use of those blessings we have too long neglected. For the present we must wait, wait patiently but not without hope, for the first steps to be made to carry out the necessary surveys in connection with, at least, one of our rivers, and to obtain other necessary data on which to frame some tangible, practical scheme.

APPENDIX J 1.

Notes on Drilling and Boring Artesian Wells, as practised in the United States of America; by Mr. C. W. Darley, M. Inst., C.E., Principal Assistant Engineer, Harbours and Rivers Department.

During my recent visit to America I availed myself of the opportunity, thus afforded, of inspecting the various systems which have been adopted there for sinking artesian well bores; and, at the request of the Honorable the Colonial Secretary, I now have the honor to submit a report upon what I saw, together with particulars and sketches of the appliances in use. I trust that my notes may be of some practical benefit and assistance to those who are likely to be engaged in searching for water at great depths in these Colonies.

In some respects I fear the information I have obtained may appear scant and insufficient; but it must be borne in mind that the time at my disposal was somewhat limited, and the distances to be travelled over, in order to see the various boring operations in progress, were immense.

The boring, as hereinafter described, being in most cases carried on by contractors who have portions of their apparatus covered by patents, some difficulty was found in obtaining information on many important points of practical detail, the contractors frequently being reticent, and suspicious as to the object of my interrogations; on the other hand, manufacturers and vendors of apparatus were most willing to furnish me with abundant information, but in all cases this had to be received *cum grano salis*, as the information imparted seldom went beyond praise of their particular apparatus, and but rarely were any really useful and practical notes to be obtained from such sources.

The States where I found most boring operations in progress were, California (where wells are being sunk for both water and oil) Colorado, New York, and Pennsylvania; in the latter State, so far as I am aware, oil and gas wells only have been sunk.

The process of sinking holes through rock, as is necessary in nearly all instances where great depths have to be reached, either for water or oil, is usually termed "drilling," and "boring" when alluvium or gravel and sand beds only have to be passed through; but in these latter cases drill gear is sometimes used to advantage, as will be hereinafter explained,—the immediate difference between the two methods being that drilling is usually done with only a limited length (about 40 feet) of iron rods, which are worked suspended from a stout hawser, while boring is carried on with continuous bars, either wood or iron, in about 25 feet lengths.

In California I found a great number of wells being bored all through the San Joaquin Valley, which embraces a large district, some 280 miles in length north and south, and some 70 or 80 miles wide, lying south of Stockton, and between the foot of the Sierra Nevada on the east and the coast range on the west. This district in its natural state, owing to the extreme dryness of the climate, the rainfall only averaging from 8 inches to 10 inches per annum, is a barren desert; the soil is of a light loamy or sandy nature, only covered in places here and there with patches or tufts of a wiry grass, and so far as I could ascertain is quite useless without irrigation. Within the last five years this land has been obtainable at about a dollar (4s. 2d.) per acre; its value however when properly irrigated has long been known. Some years ago a large tract was brought under cultivation, with the assistance of water supplied by canal and flume companies, who constructed flumes from the head waters of the King's River, and entered into contracts to supply landowners with a certain quantity of water per acre per annum, at a fixed rent, the supply being guaranteed to the users by deed for a fixed period, usually 99 years; the right thus acquired is transferable with the land. Owing to the limited quantity of water, however, but a comparatively small district has been thus improved. Knowing how valuable the land became with the assistance of water, induced the settlers to endeavour to obtain a supply by artesian wells, which latter have now proved so successful and reliable that land throughout the valley is worth on an average at least $50 to $60 (£10 to £12) per acre, some land suitable for fruit-growing realizing over $100=£20, per acre.

The water is usually found at depths varying from 350 to 600 feet, in a bed of sand which is overlaid by beds of impervious clay, and clay and gravel mixed, the upper 40 to 80 feet throughout the valley being light, loamy, and alluvial deposit.

In the gravel beds, immediately beneath the upper alluvial deposit, water is frequently met with, but it is usually limited in quantity, indifferent in quality, and seldom or indeed never rises to the surface; on small farms and homesteads however it is not despised, being generally sought for and obtained by the ordinary drive, or Abyssinian tube wells; but as the water must then be pumped, it cannot be economically used for irrigation purposes, although in some districts where water has not been obtained from deep artesian wells, hundreds of the drive wells have been sunk and the water raised by windmills.

When sinking artesian wells it is necessary to stop back this upper water, for two reasons; first, to prevent it contaminating the purer supply from below; and secondly, which is the more important, to prevent the rising water being lost or absorbed in the upper pervious measures. This led to the bores being lined throughout with iron tubes or casings, which is an imperative necessity, for in some instances, where the ground was found strong enough to stand without caving, unlined bores were tried, but they were found never to flow till lined.

The absence of watertight lining will probably be found the reason why water has not risen to the surface more frequently than it has done in the numerous well shafts sunk in Australia, where it is well known that a porous stratum, frequently containing brackish water, is usually found at depths of from 40 to 90 feet below the surface, the brackish water in some cases having been stopped back sufficiently to allow the sinking to continue till fresh water was reached; the latter then rose in the well to within some 30 to 60 feet of the surface, but no higher. There can be little doubt that in such cases the lower water found an escape through the pervious measures; had a watertight lining been used, it is quite possible that many of these wells would now have been flowing ones, *i.e.*, the water would have risen above the surface.

I wish, however, to guard myself from being misunderstood on this point, as I do not desire to raise false hopes by conveying the idea that any method of treating artesian bores in water-bearing measures will obtain flowing wells, as this wholly depends on the situation of the bore geologically; to obtain this, the water must be stored in the earth and have communication

communication with an under stream or water-bearing strata, leading from hills situated higher than the ground surface at the bore. The hill source may be a great distance away; still, if the water-bearing-strata are overlain with measures of impervious clay, upon these measures being pierced the water will rise to the surface, unless, as before mentioned, it finds an escape through upper pervious measures.

In the case of the San Joaquin Valley, already referred to, the abundant supply found there of course comes from the neighbouring Sierra Nevada, where the winter snow is stored and given out throughout the spring and summer months, just when the water is most needed, the mountains thus acting as a natural reservoir for conserving the water.

The business of sinking artesian wells has become such a large one in the States that a great many contractors have turned their attention to the subject, nearly all of whom have introduced some special methods and appliances of their own for carrying on the work. Frequently the contractors take the work on the "No cure no pay" system, that is, if they do not find a flowing well they are not paid; but of course this is only done in districts known to contain artesian water, it being merely a matter of going sufficiently deep to reach it. Under this system, should any failure occur, either through carelessness or accident, which may render it necessary to abandon the bore, and perhaps a considerable length of the casing within it, the loss falls on the contractors. So far as I could ascertain, the cost of the work is very much the same with one apparatus as with another; but as there are varying circumstances under which each kind may have a special advantage, I will describe three kinds of apparatus which will fairly represent the different types of machines mostly in use:—

1st. The ordinary boring apparatus, with a variety of special tools used in connection therewith.
2nd. The hydraulic well-borer.
3rd. The ordinary drilling apparatus, as specially suited for artesian wells where the depth rarely has to exceed 600 feet.

Hand-boring Apparatus.

The ordinary boring apparatus consists of a wood or iron derrick (see plate I), with a sheave on top, about 30 feet over the ground; beside the single leg is placed a crab-winch carrying a sufficient length of 1½" iron or steel wire rope; the winch usually has two driving pinions, one for working by hand, the second for working by horse-gear, for running up the rope quickly, more especially when working with the sand-pumps. The boring bit (varieties of which are shown on plate II, figures 7, 8, 9, 11) is attached to the rods, which are usually made up in 25 feet lengths, either wood or iron, the iron ones being made of 1½" gas pipe, with screwed pin and box ends welded on; these however would be found too heavy on the boring tool if wholly used, so it is the practice to use some rods of pine, 4" x 4" (see plate I, fig. 2), which owing to their buoyancy in the water with which the bore is charged, help to balance the weight of the iron rods. The top or working rod is usually made of 1½" square iron, on which a capstan spanner travels and works—two men are sufficient for giving the necessary circular motion to the rods. It will be seen that in this process much delay must necessarily be incurred in drawing the rods every time the auger is filled, which happens about every fourth or fifth foot sunk. The rods on each such occasion have to be raised, unscrewed, and laid aside one by one, the reverse operations when lowering taking an equal time. Notwithstanding this delay, I found that the 7-inch wells were bored to a depth of 400 feet and lined with casing at an average rate of nearly 25 feet per day—the first 100 feet being performed much quicker, and of course the last 100 feet proportionately slower. When adding on or sinking casing, the rods need not be withdrawn, but left standing on the bottom or suspended from the expanding plug (see plate II, fig. 3), the top or capstan length only being removed. The auger bits are made in a variety of patterns, some altogether with closed sides for working in sandy or very loose ground, others made with one side quite open like a carpenter's shell auger and termed the pod auger (see plate II, fig. 7). This pattern is found to work very well in stiff clay, and is readily emptied. When beds of fine sand are met with, then the sand or sludge pump, as shown at plate V, fig. 15, must be used; this is usually lowered by a small line and jumped when at the bottom till the sludge or sand is worked up loose, when it readily fills, and upon being drawn up quickly the ball valve prevents the sludge from escaping; when emptied it is again lowered, and the process repeated till the bore is clear ready for the rods to be lowered and the boring resumed.

Besides the common sand-pump last referred to, which can only be filled by jumping it on the bottom, there are others made with a sucker valve rod, which, when the pump reaches the bottom, is worked up and down with a light line from the surface; this pumps the barrel full of the sand or silt, at the same time discharging the water above the plunger. Another form of pump for clearing out bores is shown on plate V, fig. 12. The great advantage attending this somewhat more expensive form of pump is the facility with which it can be emptied by simply knocking up the sliding sleeve on top, when the tube opens longitudinally with a scissors' joint, instantly releasing its contents.

Care must be taken in boring not to let the excavation get too far in advance of the casing, or the sides may cave in, and cause the bore to become out of line. Should this occur it may be found impossible to force down the casing, and consequently render it necessary to abandon the bore.

I found that the invariable practice is to start the bore 7 inches diameter, and if possible carry it the same size all the way down, but in most cases the friction against the casing becomes too great to admit of its being sunk more than 300 feet of this size, and then a 6-inch casing is put inside and the hole carried on with the smaller diameter to the required depth. In a few cases I found 8-inch and 7-inch holes being sunk, but these sizes are exceptional, 7-inch and 6-inch being generally found large enough. When a hole containing two sizes of casing, in this way, is finished, the inner or smaller casing is usually cut off by special tools a little above the bottom of the large casing, and the upper length withdrawn to be used again. A tool suitable for this purpose is shown on plate II, fig. 6.

As it is necessary that the auger should bore as near as possible to the inside diameter of the casing, it is necessary to have a set of augers for each size, *i.e.*, about a 6¾-inch auger for the 7-inch casing, and 5¾-inch for the 6-inch casing.

When about to start a bore, as soon as the derrick is set up, a hole should be dug under the centre some 6 to 8 feet deep, and the first length of casing set up vertically in the centre; the earth is then filled in round it again and well rammed, thus forming a guide and insuring a fair start for the boring tools.

A horse-power machine is usually used in conjunction with this boring apparatus, for the purpose of operating the winch rapidly when drawing the rods and working the sand-pump; the most convenient method of conveying the motion to the winch is with friction wheels applied with a cam motion; in this case the horse can be kept constantly moving when drawing rods; the attendant need only place his foot on a lever to throw the friction pinion in contact with the winch wheel, and thus wind up the rods 25 feet at a time, or as may be necessary. The circular motion for working the rods is, however, given to them by two men walking round with the capstan spanner as before mentioned.

Hydraulic Boring Apparatus.

This apparatus (see plate III, fig. 7) is worked very much on the same principle as the diamond drill, the action of which is, I believe, pretty well understood now in this country. The rods are formed in the usual 25-feet lengths of strong gas or lap-welded iron piping, 2½-inch or 2¾-inch internal diameter, with screwed wrought iron spigots and socket connections at their ends (see plate III, fig. 1); the lower length carries the cutter, the best form of which is shown at plate III, fig. 2.

A strong stream of water is pumped continuously down the rods, through a swivel cap at the top, shown at fig. 4. The rods are driven at a speed of about 80 to 100 revolutions per minute, and the débris from the cutter is carried up the annular space between the rods and the casing, with the escaping water, and discharged at the surface. As the casing is rarely less than 7 inches internal diameter, it is necessary to thicken up the rods, encasing them in wooden lagging to reduce the area between the rods and casing, and thus increase the velocity of the discharge water, to enable it to carry up the débris as fast as the cutter excavates it. The rods, joint, and lagging are shown at figure I.

The arrangement of derrick used is shown on plate III, fig. 7. To secure the proper speed and power requisite to manipulate this machinery a steam-engine is necessary. The pump for forcing the water down the boring bar may be attached to the engine, and the water supplied to the pipe head through a flexible rubber hose. This machine is capable of doing very rapid work. I witnessed about 20 feet being sunk in about half an hour, the depth of the bore at the time being some 524 feet below the surface; this included pressing down the casing at the same time, but of course not the building and riveting up of the casing, this part of the work occupying more time than the actual boring.

The contractor had arrived on the ground with his plant to start the bore just 11¾ working days before the date of my visit, and, as above mentioned, the bore was then over 500 feet deep, cased all the way; necessarily some time was lost at first in setting up the derrick and engine, excavating a tank for water supply, &c., so that the actual boring and casing must have been carried on at a rate considerably over 50 feet per day. The actual quantity of water required was not very great; for by providing a settling tank to receive the discharge water, the silt and débris soon settles, and thus the same water can be used over and over again. However, the very fact of any water being required, even for working the engine, will restrict the use of this apparatus very much indeed in Australia.

Upon

Upon reference to plate III, fig. 4, it will be observed that on the upper hollow boring bar *a* is screwed a short length, *b*, carrying a cast-iron chamber, *c*, in the base of which the head of the short bar *b* can revolve freely between brass washers, at the same time making a comparatively watertight joint; on the same bar is keyed a spur wheel, *d*, into which a pinion-wheel, *e*, gears; this pinion has a square hole through the centre, travelling freely up and down the 1½-inch square bar *f* at the side; to this bar is conveyed rapid rotary motion through bevel wheels, *g*, which are driven by a belt from the main shaft *h*. As the bars sink in the hole, the pinion slides down the square bar, following the spur-wheel and imparting the necessary rotary motion to it in every position. To the head *c* is coupled the flexible hose leading from the pump attached to the engine.

In this apparatus, as in the hand-boring apparatus, much time is lost when it becomes necessary to draw the rods; but of course, owing to the débris being conveyed out of the bore by the water, the rods have not to be so frequently drawn; but when a gravel bed is passed through the large stones cannot be washed up, and the rods must then be drawn, and a large-valved sand-pump lowered down to bring up the shingle, &c. With this apparatus I saw hydraulic pulling-jacks, very suitably applied for drawing down the casing, which will be described further on, one man attending them drawing down the casing, while the second man attended to the engines and boring apparatus. An ingenious and simple device for suspending the rods in the bore while adding on casings is shown on plate II, fig. 3. This is simply a round piece of pine, nearly the diameter of the casing, cut in three pieces, the central portion being wedge-shaped. Into this piece is fixed a length of bar with spigot and socket screwed unions; this is screwed on to the top of the rods and lowered; when a short way down the side pieces are checked with a string; the weight of the rods drawing down the central wedge causes the blocks to jamb in the casing; there they remain suspended till the upper bar is lowered down, screwed on, and pulled up, thus drawing the wedge and permitting the rods to run up freely.

It is only right that I should mention that Messrs. Jerome Haas and James Manning, of Stockton, California, U.S.A., contractors for well-sinking, have brought this system to great perfection, and have taken out several patents for improvements in the various parts of the apparatus.

Drilling Apparatus.

The drilling apparatus ordinarily used for sinking wells not exceeding (say) 800 feet deep is shown on plates Nos. IV and VI. These are both handy and portable machines; they are usually provided with an axle and wheels, which enable them to be transported across country easily, all the gear, horse-power, &c., being stored on top for transit.

When holes have to be sunk much greater depths, such as 1,500 to 2,000 feet, then it is desirable to use much heavier appliances driven by steam, and what is known as a walking beam or Pennsylvanian rig becomes necessary; this is, however, seldom made in a portable form, a fresh derrick being usually erected over each hole. Nearly all drilling apparatus for bores from 600 to 800 feet deep are worked on the same principle, so one description practically answers for all.

The derrick, shown on plate IV, fig. 1 (and partly enlarged at fig. 2) has two working barrels; on one is wound sufficient 2-inch rope, termed "the sand pump line," to reach the bottom of the deepest bore required, and the second barrel carries the drill cable, which may be either a hempen or Manila rope of similar length and about 5 inches girth; this rope passes from the barrel over a sheave, fixed halfway up the derrick, then down and through what is termed the Pitman sheave, *a*, in fig. 2, then up and over the sheave at the head of derrick, and finally down and made fast to the head of the drill bars.

The drill bars are made up as follows:—

First the bit,	... ...	about	4 feet long
next ,,	auger stem	,,	12 ,,
,,	jars	,,	5 ,,
,,	sinker bar	,,	8 ,,
,,	rope socket	,,	1 foot long
	In all say		30 feet long.

The above lengths may vary very much, of course, according to circumstances, the bars used for deep oil wells being made up as much as 60 feet long and up to 4 inches diameter; those used for shallow holes need not exceed from 2½ inches to 3 inches diameter.

The derrick is first set up true over the centre of the bore, and the casing sunk (say) 8 feet, as before described, to start the hole fair; then the drills may be lowered into the bore and started. From the sketch given of the gearing, it will be seen that the horse power or engine may be kept constantly going, clutches being provided for throwing either of the barrels or the Pitman sheave into gear when required. When the clutch at *b* is put into gear, the Pitman sheave is given an up and down motion equal to twice the throw of the crank on the end of the shaft *c*. As the drills sink, the rope is lowered out by applying a pinch-bar or feed-lever to the brake wheel *e* and bearing down on it till the pawl in the wheel on the end of the cable drum *d* can be released; then hold the brake and lower out as much cable as may be necessary, and when the tools reach the bottom again throw in the pawl. The lever marked *f* is for working the clutch *g*, which travels on a feather on the driving shaft and engages the cable drum for raising the tools. The lever *h* is for tightening the belt on the pulley on the driving shaft, and enabling it to drive the barrel *i*, which carries the sand-pump line; this may be a light wire rope, to the end of which is attached the sand-pump. It will thus be seen that the tools can be raised rapidly by the cable drum; when they are up and landed disengage clutch *g*, drop the sand-pump into the bore, easing it down if necessary by pressing on the lever *h*; and when filled again press on lever *h* and the sand-pump is rapidly wound up, the engine or horse-power being kept in motion all the time. Thus a very few minutes suffice for raising the tools, clearing out the hole, and lowering the tools down to work again; and the whole operation can be attended to and manipulated by one man, a second man only being necessary for driving the engine or horses; the assistance of the second man is also necessary when it comes to building, and driving or sinking the casing.

When the hole is first started the tools may be kept short by omitting the sinker bar and jars. Should the hole be dry, water must be poured in from time to time, and when the tools stick, draw them and clear out with the sand-pump. As soon as rock is met with it is necessary to add on the jars and sinker bar, otherwise the tools may stick fast in the hole; the loose action of the jars enables an upward blow to be given, by shortening in the cable and continuing to work the Pitman sheave; when an upward hammering action is imparted to the tools this seldom fails to start them up. Should the tools be found to stick, through the hole getting out of shape, one of the reamers, shown on plate V, figures 17, 18, 19, should be used to true up the hole before proceeding with the drilling.

The description above given more particularly refers to the Gillespie Tool Company's machine, but the same will almost exactly apply to the Pierce machine, plate VI. I saw both machines at work at different places, and, on the whole, would give the preference to the Gillespie apparatus, as being the more compact, but in actual work I doubt whether there is any practical difference between them; both being good and well designed machines, and, I believe, the best for the work to be found in the States.

Pennsylvanian Rig.

As I have referred to the Pennsylvanian oil rig, a brief mention of its principle may not be out of place here. This machine is specially arranged for deep sinking, when bores 1,500 to 2,000 feet or over are necessary. In this case the tools are made up exactly as before described, but larger and much heavier; tools 4 inches diameter and 55 to 60 feet long are generally used for deep 7 and 8-inch holes.

Over the site fixed upon for the hole is constructed a derrick, as sketched on plate No. VII. This derrick should be not less than 70 feet high, 20 feet square at the base, and 3′ 6″ at head. The corner timbers of the framing may be 6″ × 6″ pine, or 4″ × 4″ hardwood, well braced on all four sides horizontally and diagonally. At one side is firmly set up a Sampson post, on the head of which is placed the walking beam. Under the outer end of the walking beam is placed a Bull wheel, carrying the cable, and on its end a crank, or what was before termed the Pitman, for imparting the reciprocating motion to the walking beam. The Bull wheel is driven by belting from a steam-engine, set up in a shed some 20 feet back. From the inner end of the walking beam is suspended a rod, with the temper screw (fig. 2) attached thereto. The bore is usually started by what is termed spudding—*i.e.*, working the tools direct from the Bull wheel, lifting and dropping by slacking or surging the rope on the wheel; once they are their own depth below the surface the walking beam is brought into play. The rope is thrown off the Bull wheel, and the end caught by the temper screw; the drilling motion is then imparted to the tools, and, as they sink, the temper screw is slacked out, thus lowering the tools, at the

the same time turning them and preventing their striking twice in the same place. The nut of the temper screw is split and held by a clamping screw, so that the leading screw can be quickly shortened in by slacking the clamping screw; at the same time a corresponding length of rope must be given out, by releasing and reclamping it in a fresh place. When the bore needs clearing out, the rope is taken on to the Bull wheel, and the tools quickly run up; the sand-pump, which is worked by a light line on a second reel, is lowered down and the hole cleaned out. In all operations of drilling, too much care cannot be taken to ensure the bit or drill being kept up to proper gauge. For this purpose it is desirable to have a duplicate of each pattern of bit used, and, with the help of a portable forge, which should always accompany a drilling outfit, the spare bit can be forged to gauge and got ready for work again without delaying the drilling. The club bit, with its hollow or grooved centre, is specially designed for conveniently forging to gauge.

This class of drilling has been carried on to such a vast extent through the oil regions that the men engaged in the work have become remarkably expert, so much so, indeed, that a bore 1,200 feet deep can often be put down in about twenty-five days, and at a total cost of about $2,000 (say £400). I visited the Bradford, Pennsylvania, district early in June, 1883, and saw from local statistics that during the month of May 226 bores had been completed, and on the 1st June that year 384 bores were in progress in the neighbourhood.

Upon completion of the bore, and if oil has been struck, the derrick, together with the walking beam, engine, &c., is usually left in place; for although the hole may spout oil at first it will most probably cease to flow after a time, and then pumping must be resorted to. A pump barrel, with the necessary foot-valves, &c., is then let down the bore and there fixed and worked by long sucker rods, the upper ends of which are attached to the walking beam, which, as before described, is set in motion by the engines and the oil thus pumped to the surface; but should the bore prove a failure and miss the oil, then the rig is usually removed, but in some parts, where timber is plentiful and cheap, it hardly pays to dismantle and remove the derrick. Throughout the oil regions the hill-sides and valleys may be seen thickly dotted over with derricks in all directions close together.

Although I have described the Pennsylvanian rig at some length, I hardly think it will be necessary to introduce it into this Colony for the purpose of searching for water.

Casing.

Hitherto I have referred to casing in connection with the bores, but without describing it. A few words as to the various kinds of casing, their manufacture and mode of sinking, are here necessary.

The class of casing I saw almost wholly used in California was what is termed riveted sheet-iron casing, as shown on plate No. VIII, fig. 1. It is usually made from No. 14 B. W. gauge sheet-iron, in 2 feet lengths, double thickness; at the bottom is a forged steel shoe (see fig. 2), turned with a cutting edge, and bored internally for the reception of a short length (about 14 inches) of inner casing, to which it is riveted; outside this comes a 2-feet length of the outer casing, which then stands 1 foot above the inner length. The tube is then built up of alternate lengths, each 2 feet, of inner and outer casing, thus breaking the joints 12 inches. The casings are made an accurate fit for one another, well tarred before driving together, and two or three rivets put in to secure them. The apparatus used for punching them on the ground, when building over the bore, is shown at figure 3. In country where saline waters are met with it is doubtful whether it would be wise to use this sheet-iron casing, there being so many surfaces exposed to corroding action that probably the iron would not last long; in most cases, therefore, it will be found cheaper in the long run to use the more expensive screwed tubes hereafter described.

The boring or drilling tools, having to work within the casing, necessarily leave a considerable amount of the surrounding soil to be cut away by the cutting edge as the casing is forced down; this is found a desirable arrangement, as it ensures a close fit which cuts off surface or bad water contained in the upper measures from the pure artesian water reached at lower depths.

Should a hard vein of indurated sand, or soft rock, be passed through by the drill, it may be found almost impossible to force the casing through it; in this case the side must be reamered out by an expanding reamer, such as that shown on plate II, fig. 5, thus enlarging the bore to the outside diameter of the casing.

The most usual method I found practised of sinking casing was with a lever, as shown at plate VIII, fig. 6; some planks are buried in the ground, or otherwise suitably loaded to secure the fixed end of the lever to, and then the other end of the lever which rests upon the casing is weighed down, either by the weight of the men, or by applying a purchase tackle to it. A suitable cast-iron cap, fig. 7, must be placed over the head of the casing, for the lever to rest upon during the operation of sinking, to prevent its being crushed or injured.

In some ground the casing sinks very freely. I saw some sinking by its own weight when at a considerable depth (over 150 feet) below the surface; it very frequently happens however that the surrounding friction becomes too great to admit of the first or 7-inch casing being sunk over 200 feet; when this happens a 6-inch casing must be lowered down inside till it reaches the bottom (the tool shown at plate V, fig. 14, being suitable for this purpose); the boring may then proceed as before, but of course with a smaller bit. The weight of the free length of the 6-inch casing helps very materially in the sinking; it will occasionally follow the auger for as much as 70 feet below the 7-inch casing before any forcing down becomes necessary. As soon as water is reached and the boring is stopped, the 6-inch casing can be cut off about 8 or 10 feet above the bottom of the 7-inch casing, by the tool shown at plate II, fig. 6, or a tool somewhat similar to the reamer shown at fig. 5, and the upper portion drawn out, taken apart, and used again in another hole; the same tool, plate V, fig. 14, used for lowering the casing, can be used again for drawing it up.

Another method of sinking casing is by using hydraulic pulling jacks (see plate III, fig. 6). A suitable cast-iron head, fig. 5, which carries a hook at each side to attach the pulling chains to, is fixed over the pipe; two 4 or 5-ton pulling jacks are buried in the ground, one at either side, their lower ends being securely fastened to a framing, which must be previously buried in the ground some 8 feet deep round the casing; the jacks are run out full length, and the long-linked chains upon being drawn up tight are attached to the hooks in the casing cap; the jacks are then pumped down, drawing the casing with them; of course when steam is used this is a simple process, still it is effectively, although at a much slower rate, done by hand. This method has the advantage that one man can be pumping or forcing down the casing at the same time that the other men are carrying on the boring.

A third method of sinking casing is by driving it; this is very simply done when a drilling machine such as the Gillespie Company's is used, for by taking a bolt out of the Pitman crank, a^1 (see plate IV, fig. 2), a peculiar drop action is given the Pitman sheave; it is then only necessary to detach the drills from the end of the cable, hang on the driving weight (plate VIII, fig. 8), place a good block of wood over the head of the casing, with a hole through it to guide the pin shown to project from the weight, then start the machine, and a series of rapid blows can be given to the casing sufficient to drive it down.

Cost of Casing.

The cost of the 7-inch riveted casing, double thickness, delivered on the ground in California, I found averaged 75 cents (say 3s. per foot), and the 6" similar casing cost 60 cents (say 2s. 5d. per foot); this is based on sheet iron costing 3d. per lb, = 28s. per cwt., delivered on the ground.

One great advantage in the use of riveted casing is that the sheets can all be cut and punched true to gauge for inner and outer lengths at the factory, and a number of plates can be safely packed together and conveniently sent up the country, where a very simple curving machine can be at hand to bend them; they are then riveted with cold rivets. There is nothing in the whole process that any handy man could not learn to do in a very short time, with the very simplest appliances.

A more permanent class of casing is made from lap-welded tubes, which can be procured in lengths up to 18 or 20 feet, turned and machine-screwed at the ends as shown at plate VIII, fig. 4. As this class of joint cannot be made on pipes less than about $\frac{1}{16}$ inch in thickness, the cost of such casing is considerably greater than the riveted, but it would certainly be found more durable and safer to use in sinking. The cost of such casing properly screwed, landed in Sydney, would be about 7s. per foot for 7-inch, and 5s. per foot for 6-inch, assuming it to be obtained in fair quantities. There are various ways of making the screwed joints, two of which are shown on figs. 4 and 5. The latter is the cheaper, but that shown at fig. 4 is the better, being the only one that secures a flush surface inside and outside the pipe, which is a most important matter.

A cheap casing is sometimes used in America, made in lengths of 14-gauge sheet-iron wound spirally and riveted along the edge (see plate II, fig. 4). I do not think this can be recommended except in very soft ground, for it is not strong enough to stand the end crushing strain necessary to be applied when pushing it down the bore.

Stopping

Stopping back impure Water.

When practicable it is desirable to use casing all the way to the bottom of the bore, but this is really only possible when the boring is through soft measures free from rock; when rock is met with the hole ought to be reamered a little, and the casing let as far as possible into it, to cut off the downward flow of impure water; but should this not prove effectual to stop back the impure water, some device such as that used in the oil wells for stopping the water back from the oil must be adopted. The method for doing this which I heard was most approved of in the oil regions, where it has been applied to nearly every bore to keep the oil free from water, is by the use of what is known as a "cap packer." This is a rubber block 8 inches or 10 inches long, made almost the neat diameter of the bore, and lowered down on the end of an inner tube, (see plate IX, figs. 2, 3, and 5). *a* is the rubber block; *b*, the inner tube, which of course must be carried up to the top of the bore; *c* is the lower tube resting on the bottom of the bore, which in the case of pumping wells acts as the pump barrel when fitted with a foot-valves, the upper valve being attached to the sucker rods; on top of the lower tube *c* is screwed a funnel-shaped piece of pipe, *d*, which widens out nearly to the diameter of the bore, and is turned with a seat on its upper rim to receive a ferrule, *e*, which slides on pipe *b*, and acts as a seat for the rubber block; pipe *b* has a stop ring, *f*, screwed at its lower end, to prevent the block sliding off when being lowered down, and another ring, *g*, at the top end to catch under a malleable iron ring fixed into the rubber block, for the purpose of drawing it from the well when required; there is another collar, g^1, screwed on, which fits the upper end of the rubber block and bears down on it; this also acts as a joint collar for the pipe. The action is therefore as follows: the lower end of the block rests on the head of the lower pipe, and the whole weight of the upper pipes rests upon the top edge of the block, thus compressing and expanding it against the wall of the bore, and effectively stopping the downward passage of impure water.

In the case of artesian flowing wells, the lower pipe, which is not necessary, can be dispensed with by using the same apparatus, but by inserting a cross-bar, *h*, fig. 2, and attaching to it a ½-inch rod of iron, which should be in long lengths screwed at the ends and coupled together and led up to the top of the bore; the inner pipe, carrying the packer at the bottom, must then be suspended from the surface and the ½-inch rod screwed hard up, to bring an upward pressure against the rubber block and thus expand it.

There is another simple way to make a watertight joint, as shown at figs. 1 and 4. This consists of an iron tube, *a*, say 4 inches diameter, with a flange, *b*, screwed on at lower end, against which are bolted two rubber rings; one, *c*, about 2 inches larger diameter than the bore, the second, c^1, placed underneath a tight fit for the bore; these are nipped up against the flange with a ring washer, *e*, and screw bolts. A calico bag about 2 feet long and made the diameter of the bore is secured at its lower end between the flange *b* and the rubber ring *c*. This bag, which encloses an annular space round the tube, is filled with a mixture of half Portland cement and half clean sand, just moistened and made into a stiff mortar; the mouth of this bag is loosely closed round the pipe, which is then pushed down the bore till the bottom reaches sound rock, at a point below the strata containing the salt or impure water; the cement may then be tamped firm home by a piece of heavy tubing, or annular cast iron weight suspended by a rope as shown on sketch. The cement will soon set hard and make a secure and tight joint.

Cost of Machines and Tools.

The cost of the Gillespie or Pierce Machines shown on plates Nos. IV and VI, including an outfit of one rope socket, one auger stem, sinker bars and jars, two bits, two winches, sand-pump and 500 feet sand-line, 500 feet of drilling cable, and a horse-power, the whole suitable for drilling 500 feet deep, would be about £200, delivered in Sydney, to which might be added about £30 for extra fishing tools, pipe riveters, lifters, stubs, &c., making an outfit in all cost about £230; but even this would have to be exceeded in the first instance by any one commencing to bore, as it would be necessary to provide a portable forge, some blacksmith's tools, spare iron, &c. For going 600 feet somewhat heavier tools would be necessary, but with the same machine the cost would be about £240; by purchasing a supply of spare box and pin stubs, a great many of the special tools shown on the drawings could be made by any ordinary blacksmith and the stubs closed on.

The boring machine outfit would not cost over £80 complete. Excepting the horse-power and crab winch with connecting gear and the screwed ends for the wooden and iron pipe rods, there is no part that could not be made up the country by any carpenter and blacksmith. Most of the machines of this class which I saw at work were evidently constructed by the owners, who in most cases I found had been mechanics, blacksmiths, or general handy men, well able to make all their own tools, as well as the numerous special tools that are found necessary from time to time during practical working.

In situations where many bores may have to be put down, and where water and fuel can be conveniently obtained, I would certainly recommend the use of steam instead of horse-power, for expediting the work, and thereby lessening the cost of labour. Almost any make of portable engine can be adapted for the purpose. To run a 600-feet drilling apparatus an engine of about 5-horse power would be ample. For the generality of work, however, I believe the ordinary horse-power machine will be found sufficient, though of course slower, both horses and horse-keep being cheap and always available throughout the country.

It is unnecessary here to refer to the cost of steam-engines, as full information can always be obtained from any Sydney importer.

American well-drilling tool catalogues quote prices for engines, but English-made engines can be landed in Sydney much cheaper.

Cost of Boring or Drilling.

As regards the cost of boring or drilling, I found nearly the one price ruled all through the country; no matter what kind of apparatus was used, a set contract price seems to have become established. What the net cost was I could not well find out, but of course it would vary a little in every case; but seeing the eagerness with which contractors sought for and took orders, it is evident the contract rate quoted below pays well.

The rates are as follows:—

	s.	d.		£	s.	d.
0 to 100 feet — 100 feet @	2	0	per foot	10	0	0
200 to 300 ,, = 100 ,,	3	0	,,	15	0	0
300 to 400 ,, = 100 ,,	4	0	,,	20	0	0
400 to 500 ,, = 100 ,,	5	0	,,	25	0	0
500 to 550 ,, = 50 ,,	6	0	,,	15	0	0
550 to 600 ,, = 50 ,,	7	0	,,	17	10	0
Cost for boring hole 600 feet deep				102	10	0
To this must be added cost of casing, which, as before mentioned, cost when riveted 3s. per foot.						
600 feet 7-inch casing, at 3s.				90	0	0
Add to this the cost of boarding the contractor and his two men, as I found was the practice for the farmers for whom the work was being done to keep them while at work, say three men for six weeks = 1 man for 126 days at 2s.				12	12	0
Total cost for a 600-feet hole				204	2	0

Say 6s. 10d. per lineal foot.

If a length of 6-inch casing had to be used the cost would be reduced a little. I have allowed six weeks for the boring; this is the outside time a 600-feet hole would occupy, unless some serious mishap occurred to delay the work. I have already mentioned a case where with the hydraulic boring apparatus a hole had been sunk over 500 feet in 11¾ working days. It must be borne in mind, however, that in this case a steam-engine was used, and when an allowance is made for procuring water, fuel, stores, &c., the cost of the work will nearly mount up to as much as the slower horse-power machine.

ARRANGEMENT ADOPTED IN CALIFORNIA FOR IRRIGATING FROM AN ARTESIAN WELL.

Upon the completion of a bore, if it prove a flowing well, the casing is left standing from 4 to 5 feet above the surface; an area of about an acre is then enclosed to form a reservoir around the well, by raising a mound of earth (say) 5 feet high; the land around is cut up into about 5-acre paddocks, termed "checks," and properly levelled off for irrigation; four main feeders, termed "ditches," are constructed from the central reservoir along the boundaries between the checks, the bottom of the ditches being kept a little above the surface of the check; very simply constructed wooden gates are placed at the opening to each ditch, by raising any one of which the water can be led along the ditch and again let out through side gates over any one of the surrounding checks needing irrigation. It will thus be seen that the storage reservoir, which holds about one and a half million gallons, is filled by the well, and emptied daily, or as the land needs it, by running the water off through the various ditches. I was informed that the farmers generally considered a good well sufficient for irrigating from 160 to 200 acres of tilled land. An arrangement of dams, ditches, and checks, such as above described, is shown on Plate X.

I experienced great difficulty in obtaining information as to the quantity of water discharged from any of the wells; the amount of course varies considerably. Only in one or two instances could I get near the tube to measure the height the water rose over the lip of the pipe; for, as already mentioned, they invariably stood out in the centre of a round reservoir some 4 feet or so deep.

I measured a few that I gained access to, and in these instances I found the water rose from 2 to 3 inches over the lip of the pipe, the local practice being to speak of the well as an inch, 2-inch, or 3-inch flowing well, as the case might be. I only saw a few 3-inch wells, and they were considered amongst the best. I estimate the discharge from a 3-inch well would be about 550,000 gallons per twenty-four hours, and from a 2-inch well about 350,000 gallons per twenty-four hours. Of course there are cases where the artesian water rises under very heavy pressure. When such are found, pipes can be connected with the casing-tube, and the water led away for supplying buildings.

A portion of the town of Honolulu, in the Sandwich Islands, is supplied from an artesian well in this way. I there saw some wells discharging under very heavy pressure—one was throwing water through a 5-inch pipe to a height of at least 25 feet into the air—but in California I did not see or hear of any such wells.

TORPEDOING WELLS.

The system adopted in Pennsylvania known as "torpedoing," for increasing the flow of oil wells when first bored, might perhaps be found of use in artesian wells.

When the oil-bearing strata is reached, and the boring is considered deep enough, a heavy charge of dynamite, with a fuse attached to it, is let down to the bottom of the well—or, better still, the dynamite charge may be lowered down with insulated wires attached, and when on the bottom fired by a portable battery on the surface. The explosion shatters the surrounding rock, opening the joints, and allows a free escape of the oil to the bore. Although this method is almost universally adopted in oil wells, I never heard of its being tried in a water-bore, but I think the experiment would be worth trying with a light charge in a case where water may be met with on strong ground.

SUGGESTIONS AS TO IMPORTING APPARATUS.

I have not had an opportunity of making myself acquainted with the nature of the apparatus that has been tried or now is being used in this Colony for drilling or boring for artesian wells. I am aware the diamond drill is being largely used for boring to test for minerals, but for the purpose of obtaining a water supply such drills are quite useless, owing to the small bore. Diamond drills can of course be made for all sizes up to 20 or 24 inches diameter, of which latter size I have seen one, but when the ordinary small bore is exceeded the cost increases rapidly. Should the Government not have already imported any machine such as I have described in my report, I would recommend that an order be sent to either the Gillespie Tool Company or the Pierce Well-excavator Company—or perhaps to both—to send out a machine and complete outfit suitable for drilling 500 to 600 feet deep; also, that they be requested to send out an experienced man with their machine to work it here upon arrival. I am sure either of the manufacturers would for their own sake select a skilful and trustworthy man, who would soon train others here into the work. Should the Department in charge of the water-augers once show that boring can be done expeditiously and at a reasonable expense, I am persuaded that private enterprise will not be slow in coming forward to import the appliances found most suitable, and that in a few years' time the Government will be entirely relieved of the trouble of carrying on this work, except through the medium of contractors.

In the event of any one having read the foregoing notes wishing to write to America for further information about the various machines referred to, I give the addresses of the makers whose names I have mentioned.

Maker and patentees of improvements in the hydraulic boring apparatus—

JEROME HAAS AND JAMES MANNING,
Stockton, California, U.S.A.

Maker and patentee of earth-boring apparatus—

B. F. MULL,
Merced, California, U.S.A.

Drilling apparatus—

GILLESPIE TOOL COMPANY,
Pittsburg, Pennsylvania, U.S.A.

Pierce well-excavating company—

CHARLES D. PIERCE,
Manager,
29, Rose-street, New York.

[Plates I to X follow here.]

Plate I.

HAND BORING APPARATUS

C. W. Darley
M. Inst. C.E.

FIG. 1.

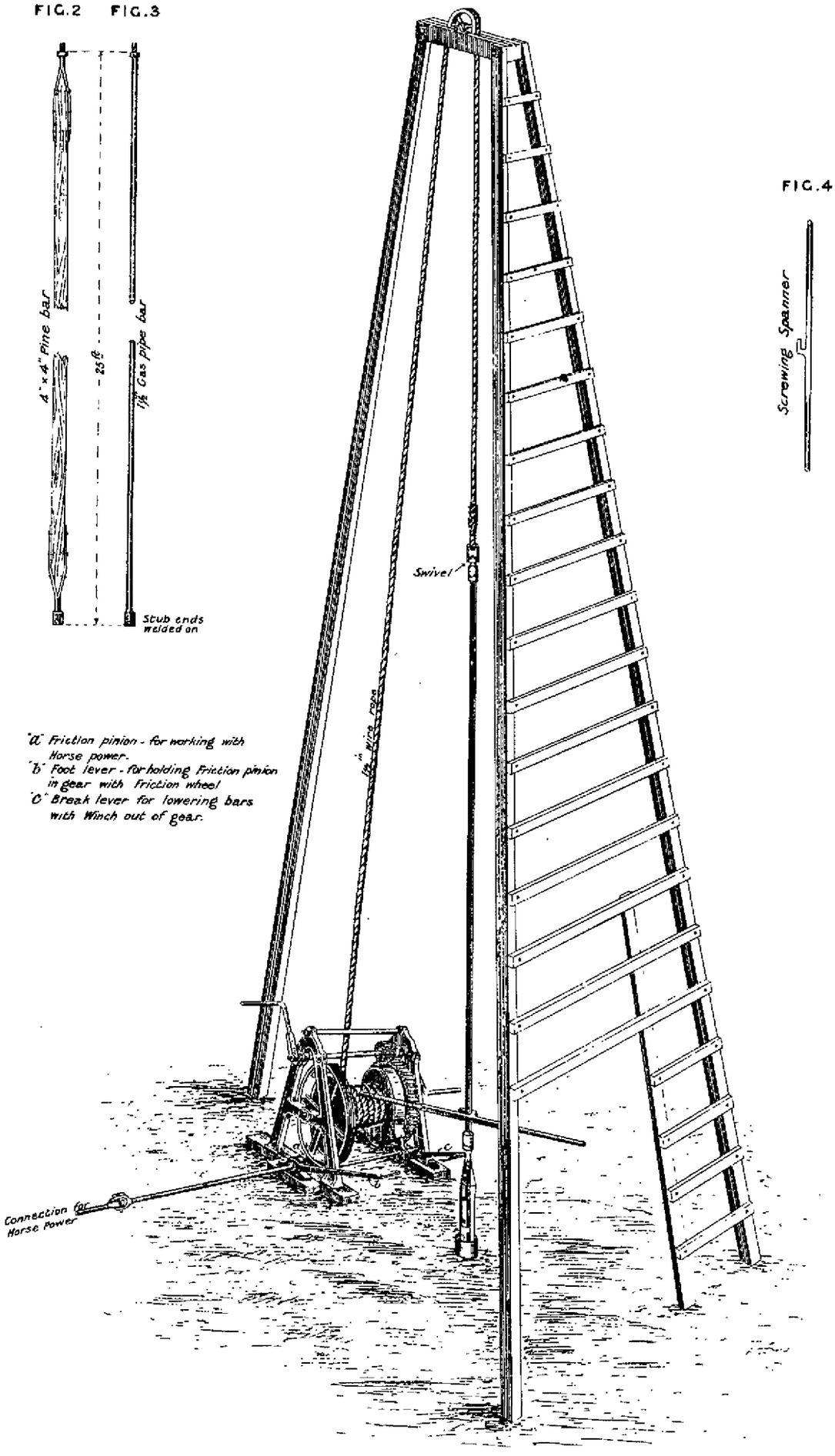
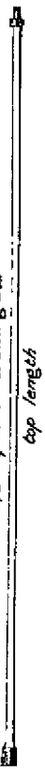


FIG. 2

FIG. 3

FIG. 4

FIG. 5.



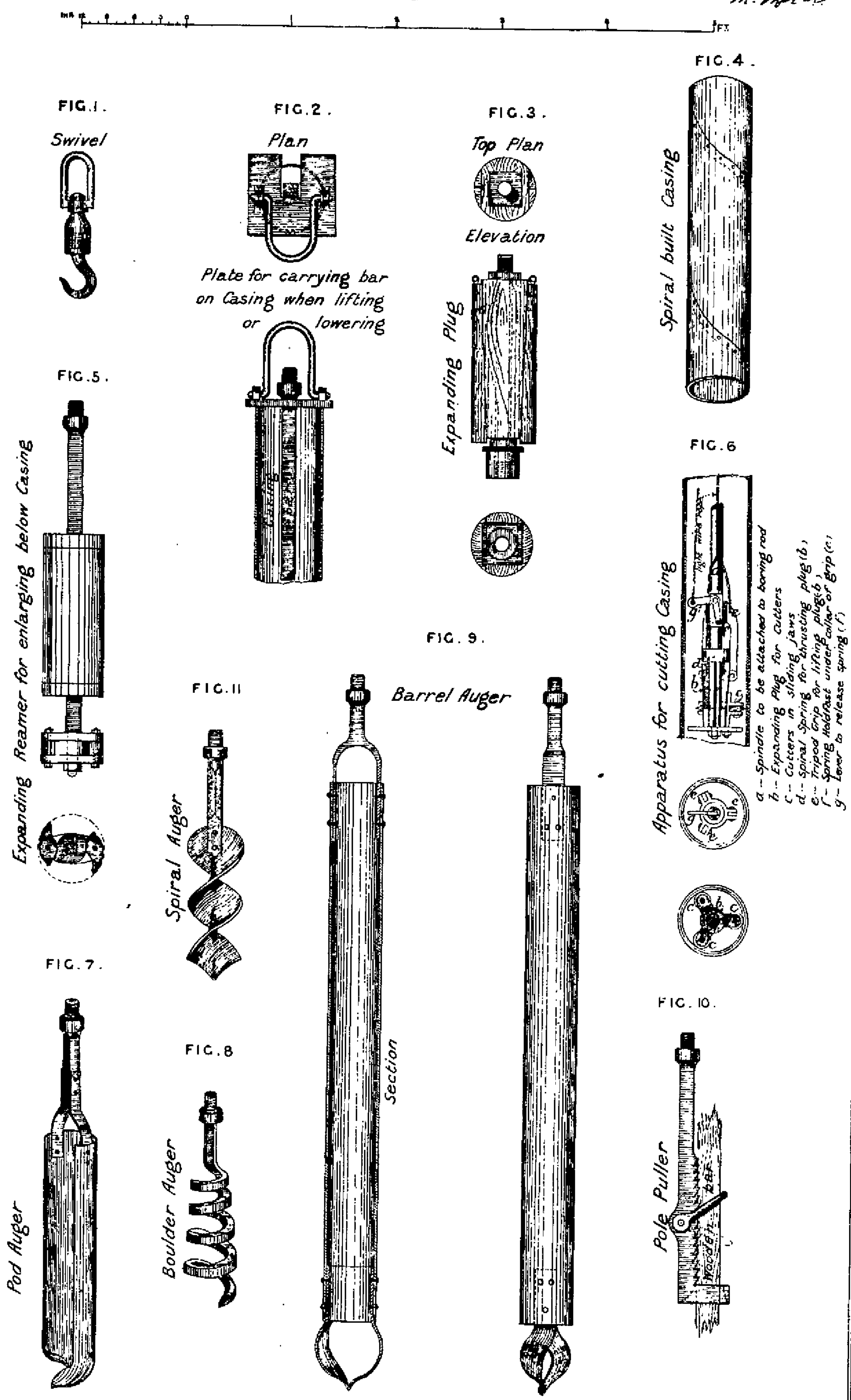
JOHN J. STONE, GOVT. PRINTER.

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
SYDNEY, NEW SOUTH WALES

Plate II

TOOLS FOR BORING APPARATUS.

C. W. Darley M. Inst. C.E.


SCALE
INS 12 9 6 3 0 1 2 3 4 5 FT
FIG. 1.
Swivel
FIG. 2.
Plan
Plate for carrying bar on Casing when lifting or lowering
FIG. 3.
Top Plan
Elevation
Expanding Plug
FIG. 4.
Spiral built Casing
FIG. 5.
Expanding Reamer for enlarging below Casing
FIG. 6
Apparatus for cutting Casing
a -- Spindle to be attached to boring rod
b -- Expanding Plug for Cutters
c -- Cutters in sliding jaws
d -- Spiral Spring for thrusting plug (b)
e -- Tripod Grip for lifting plug (b)
f -- Spring Holdfast under collar of grip (e)
g -- Lever to release spring (f)
FIG. 7.
Pod Auger
FIG. 8
Boulder Auger
FIG. 9.
Barrel Auger
Section
FIG. 10.
Pole Puller
Wooden Bar
FIG. 11
Spiral Auger

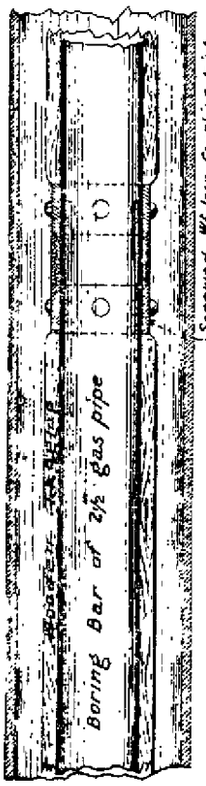
JOHN J STONE DELT

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.

HYDRAULIC BORING APPARATUS

Captain Ley
M. Inst. C.E.

FIG 1.



SCALES

FIG 4

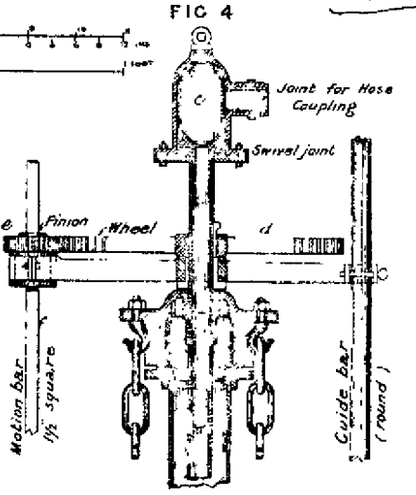
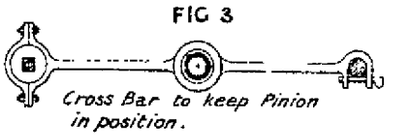


FIG 3



Cross Bar to keep Pinion in position.

FIG. 5

Cap for Casing when pulling down.

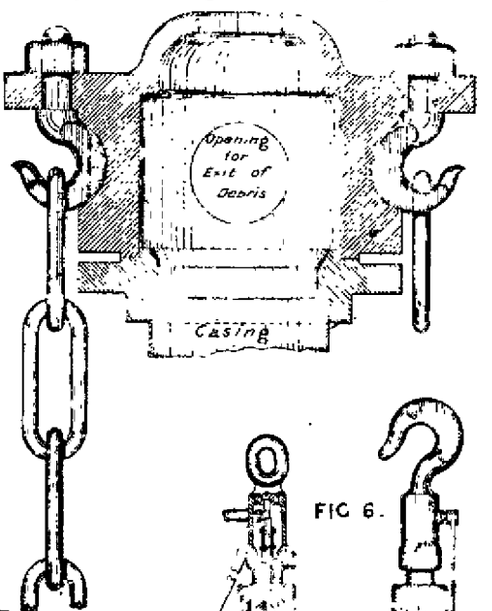


FIG. 2.

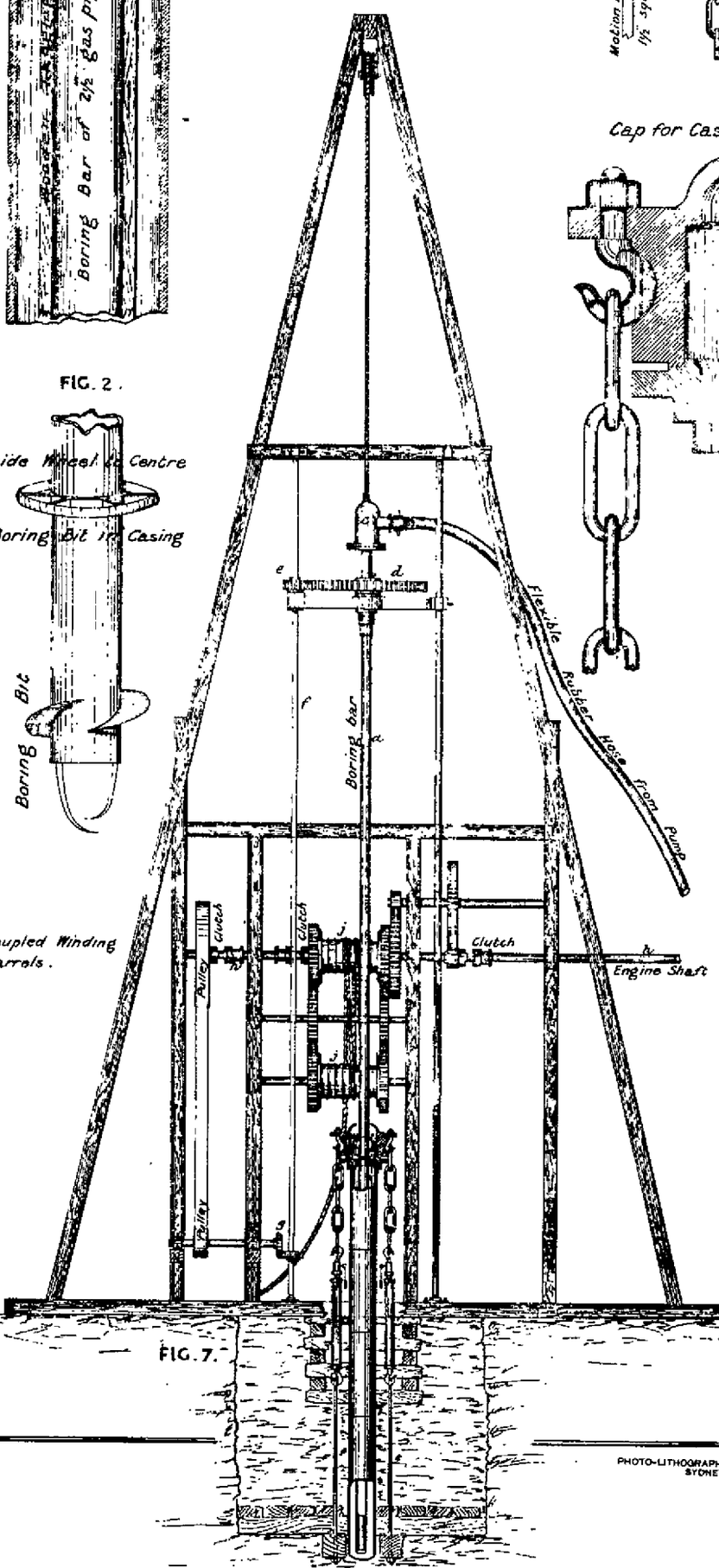
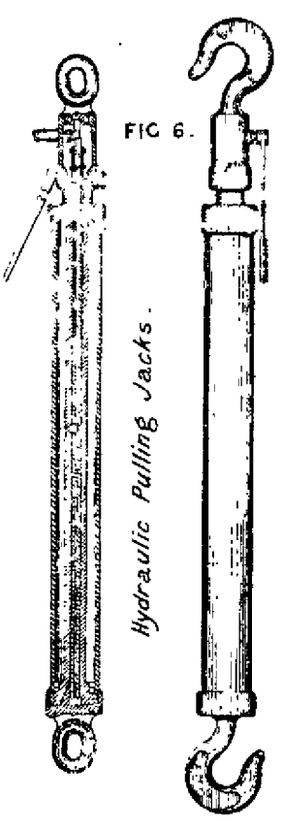


FIG. 7.

FIG 6.



Hydraulic Pulling Jacks.

JOHN J. STONE DEL.

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Plate IV.

GILLESPIE'S DRILLING APPARATUS

C. W. Darley
M. Inst. C.E.

FIG. 1

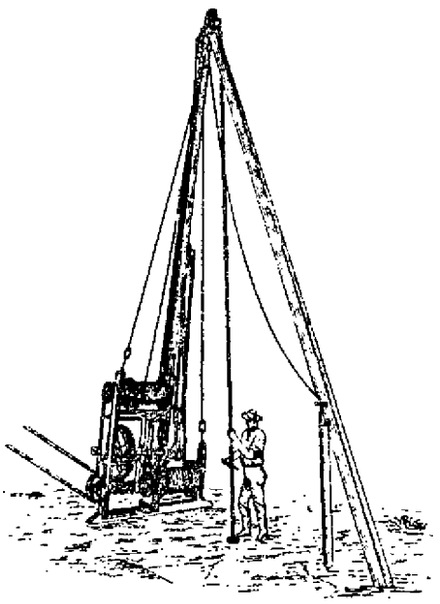

FIG. 2

ENLARGED SKETCH SHEWING THE MECHANICAL DETAILS

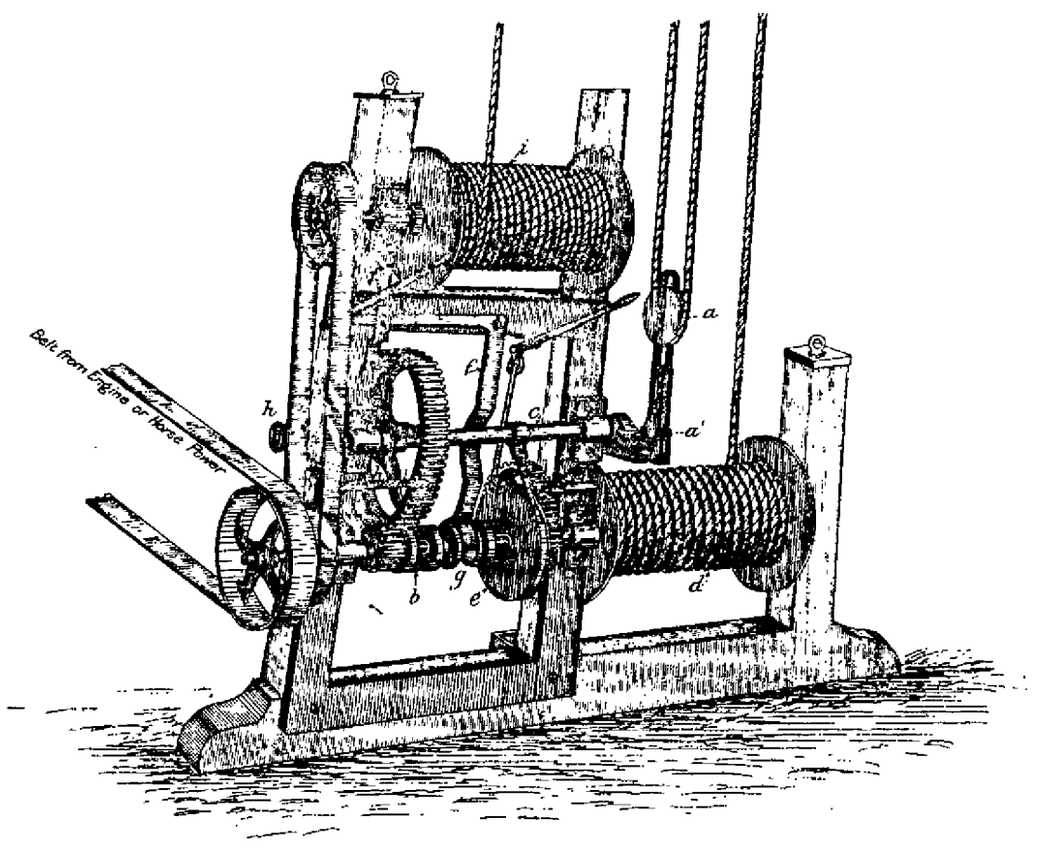

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Plate V.

TOOLS FOR DRILLING APPARATUS.

C.W. Darley
M. Inst. C.E.

SCALE

FIG. 1.
Rope-Socket

FIG. 2
Sinker-Bar

FIG 3
Jars

FIG 4
Auger-Stem

FIG 5
Bit

FIG 6
Rope Knife

FIG. 7
Swivel

FIG. 8
Rope Spear

FIG 9
Stubs
for welding on to bars
Box
Pin

FIG 10
Fishing Crab

FIG 11
Reducing Stub

FIG. 12
Sand Pump and Well Digger
Sand Valve

FIG. 13
Universal Crab

FIG. 14
Apparatus for lowering Casing also for fishing for and drawing Casing
A
A
B
B
SECTION AT A-A
SECTION AT B-B

FIG 19
Star Reamer

Spanner

FIG 15
Ordinary Valve Sand Pump
Flap Valve

FIG. 16
Club Bit

FIG. 17
Reamer

FIG 18
Round Reamer

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Plate VI

C. W. Darley
M. Inst. C.E.

PIERCE'S WELL DRILLING APPARATUS

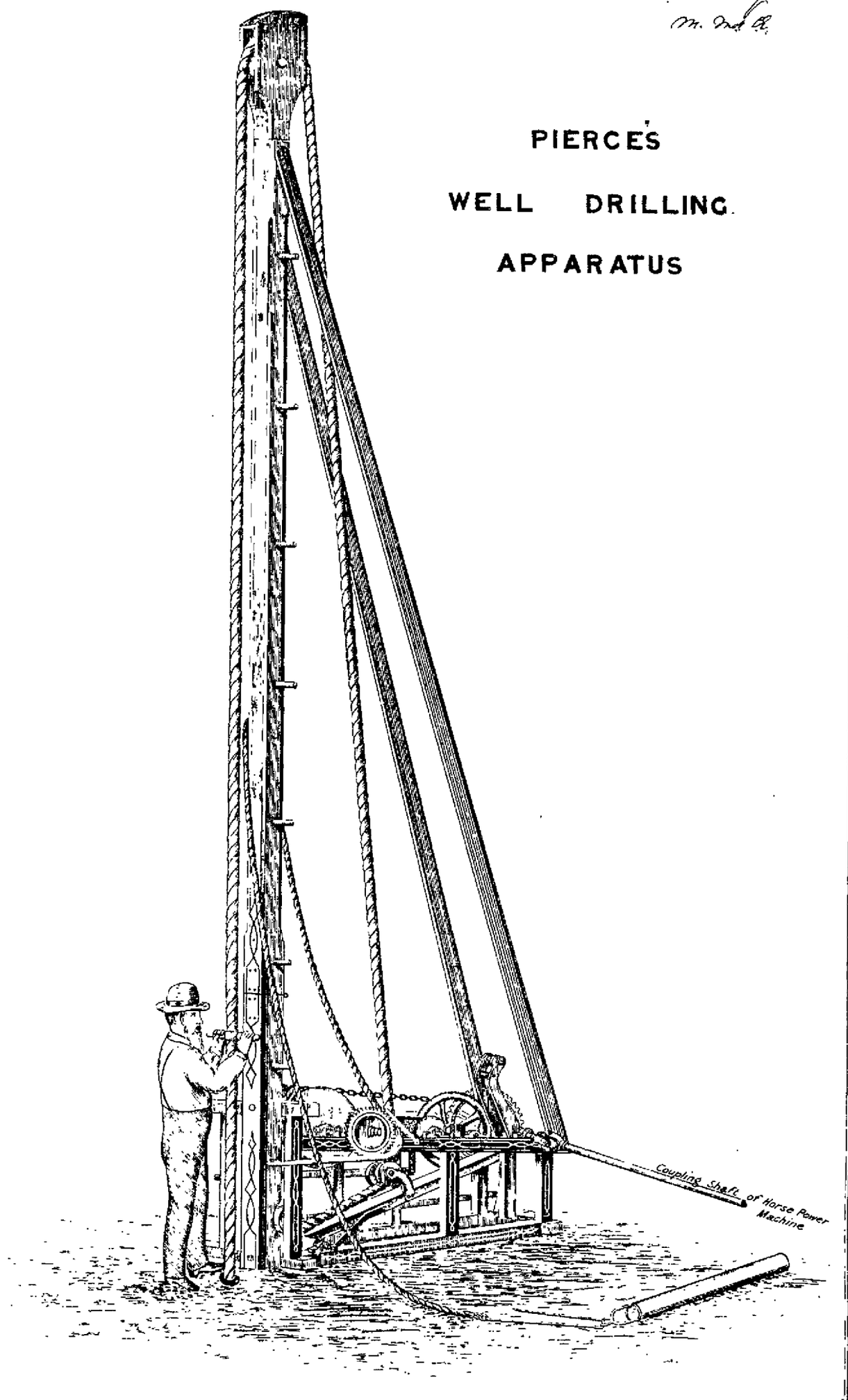
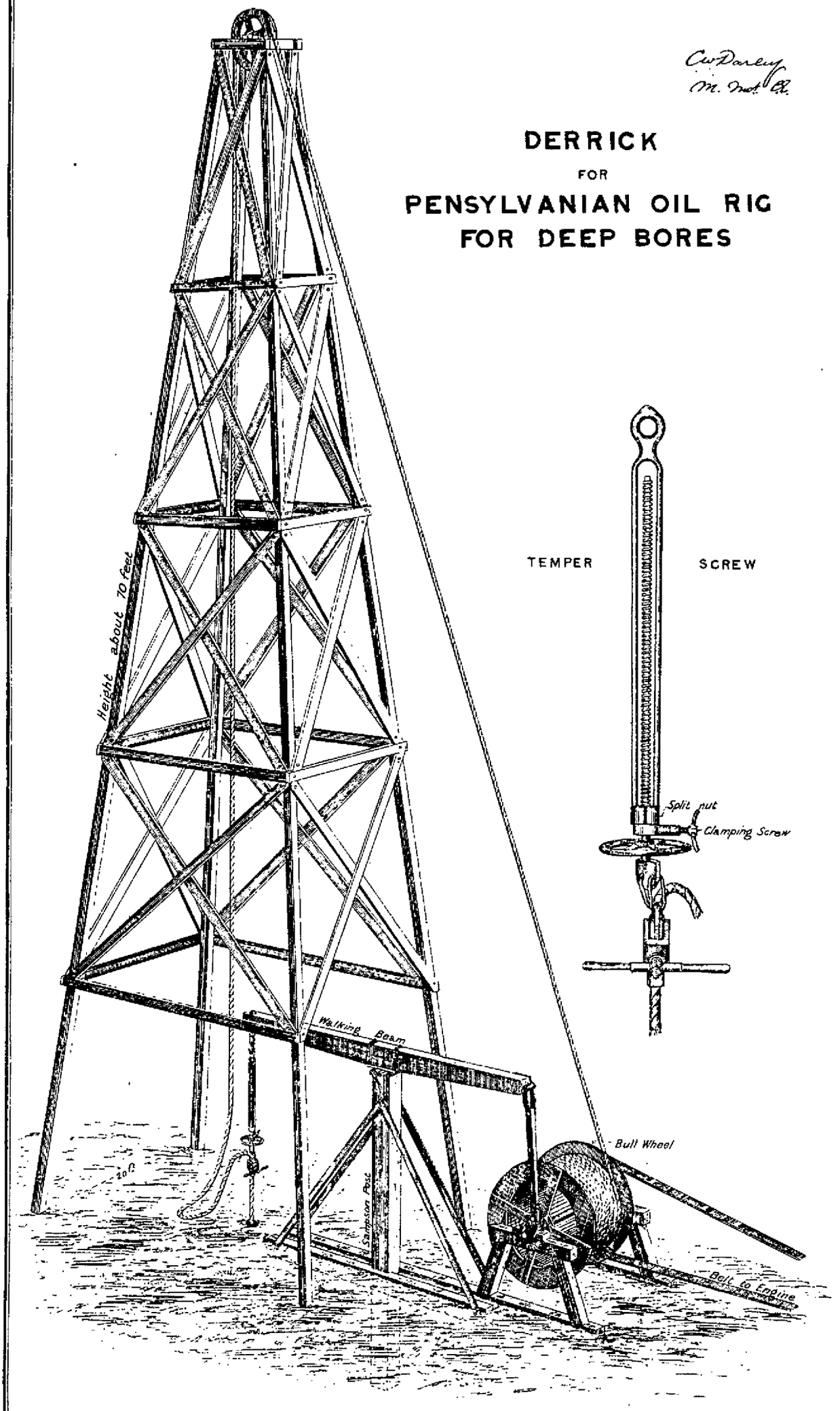


Plate VII

C. W. Darley
M. Inst. C.E.

DERRICK
FOR
PENSYLVANIAN OIL RIG
FOR DEEP BORES



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IRON CASING

C.W. Darley
Mr. Mot Off

REFERENCE

Fig-1 - Wrought Iron Casing built in 2ft lenghts
" 2 - Detail of Casing shewing rivetted laps
" 3 - Apparatus for punching Casing
" 4 - Wrought Iron Tubing with screwed ends and butt joints.

REFERENCE

Fig-5 - Wrought Iron Tubing with taper ends - screwed
" 6 - Method of sinking Casing with a 30ft lever
" 7 - Cast Iron Cap - to be used with lever
" 8 - " " Weight for driving Casing

FIG. 1

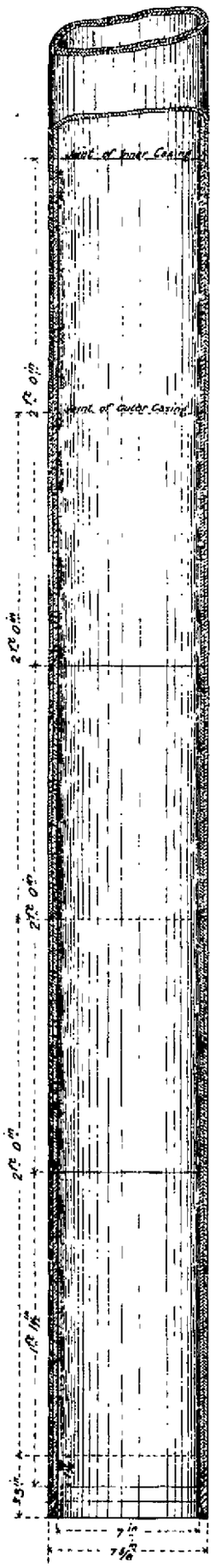


FIG 3

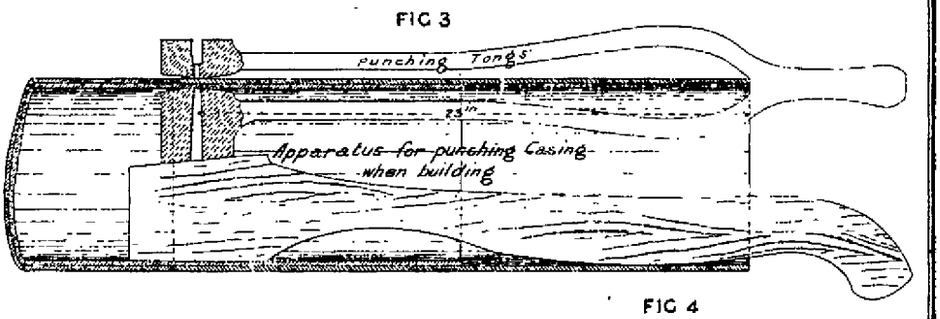
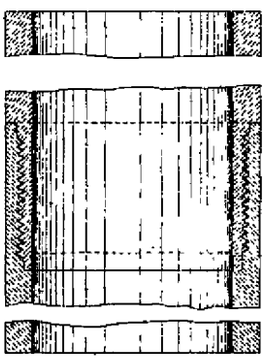


FIG 4



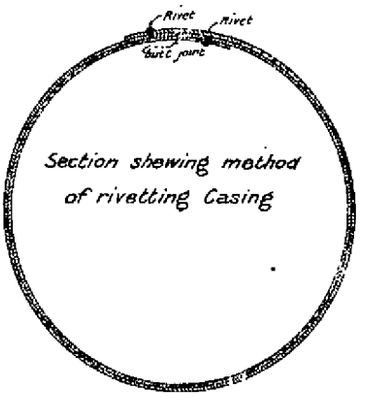
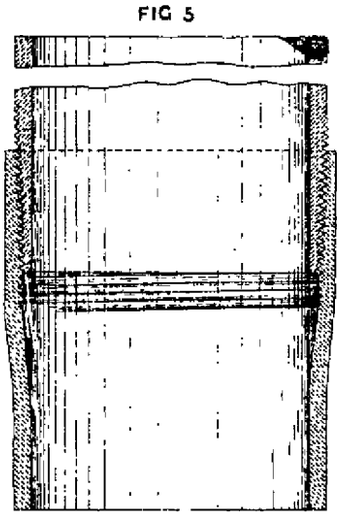


FIG 2

FIG 5



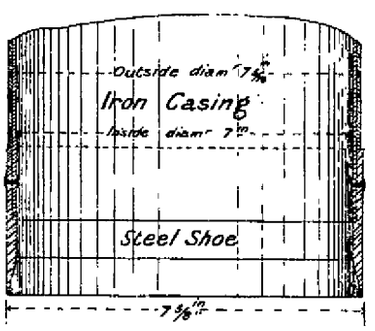
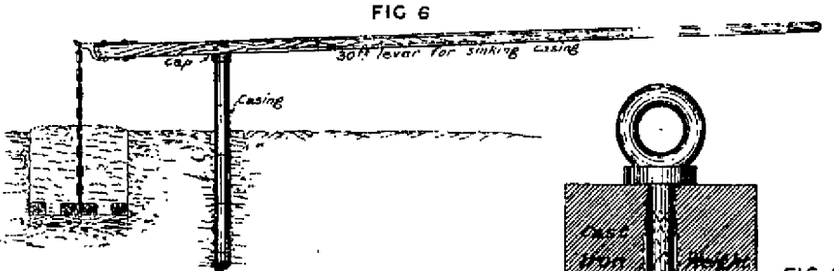
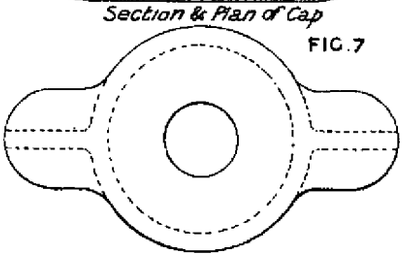


FIG 6



Section & Plan of Cap

FIG. 7



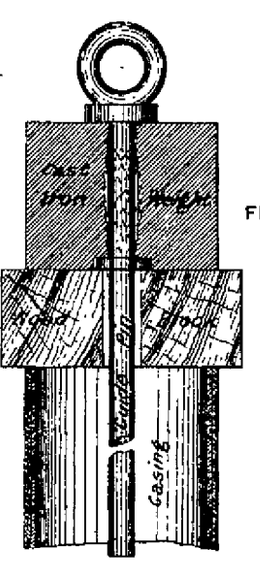


FIG 8

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Plate IX

METHOD ADOPTED FOR STOPPING BACK IMPURE WATER

SCALE

C. A. Daley
M. Inst. C.E.

FIG. 1

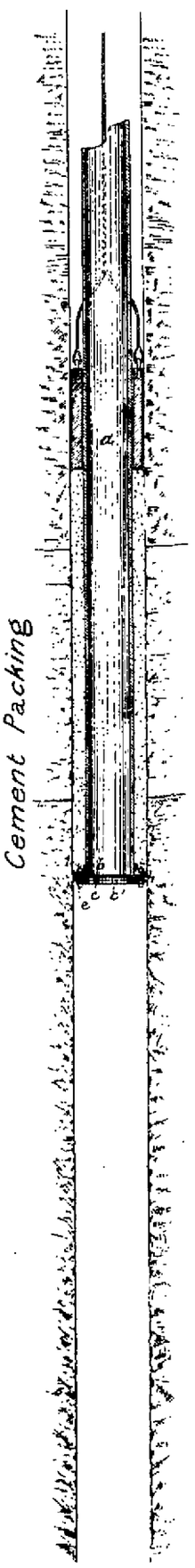


FIG. 2

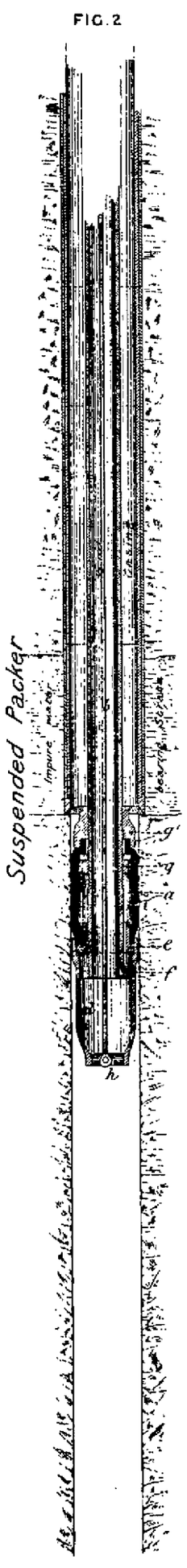
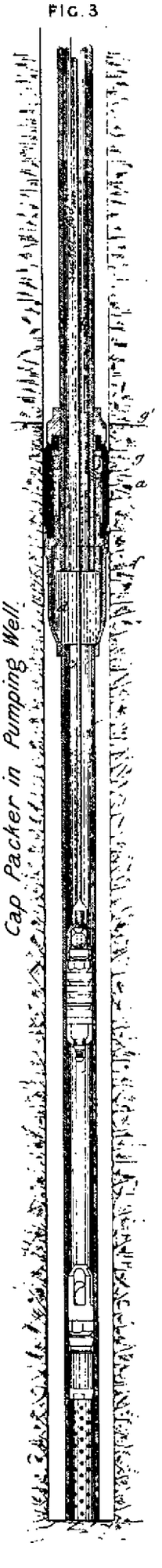
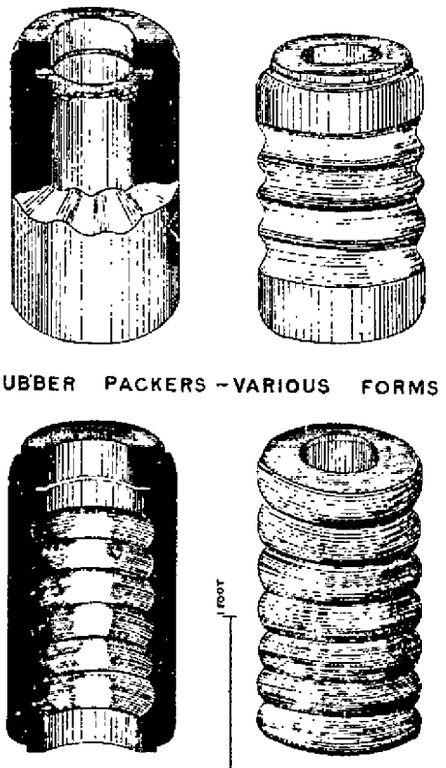


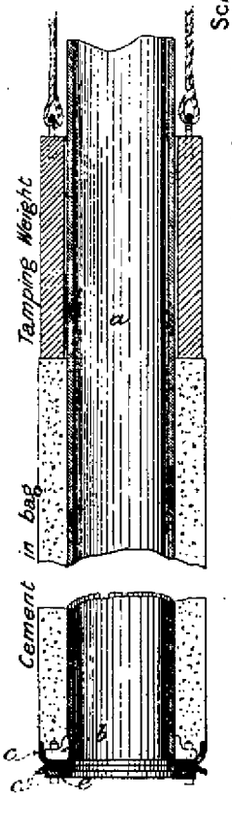
FIG. 3





RUBBER PACKERS – VARIOUS FORMS

FIG. 4



SCALE

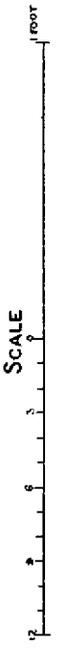


FIG. 5

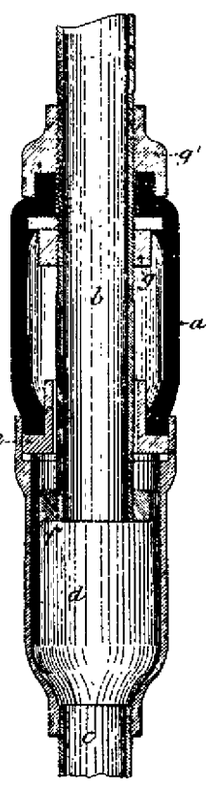


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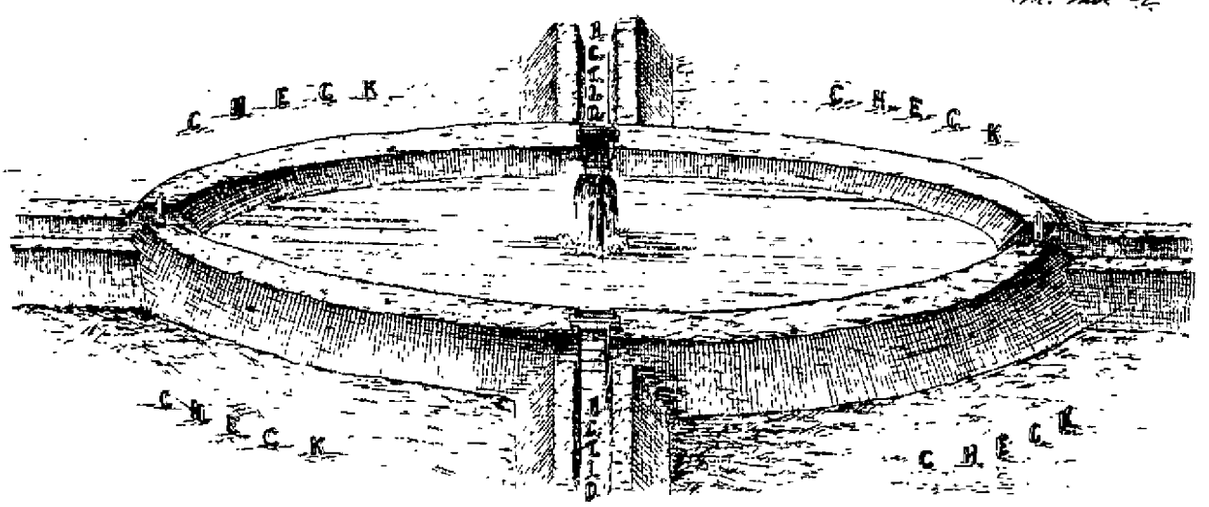
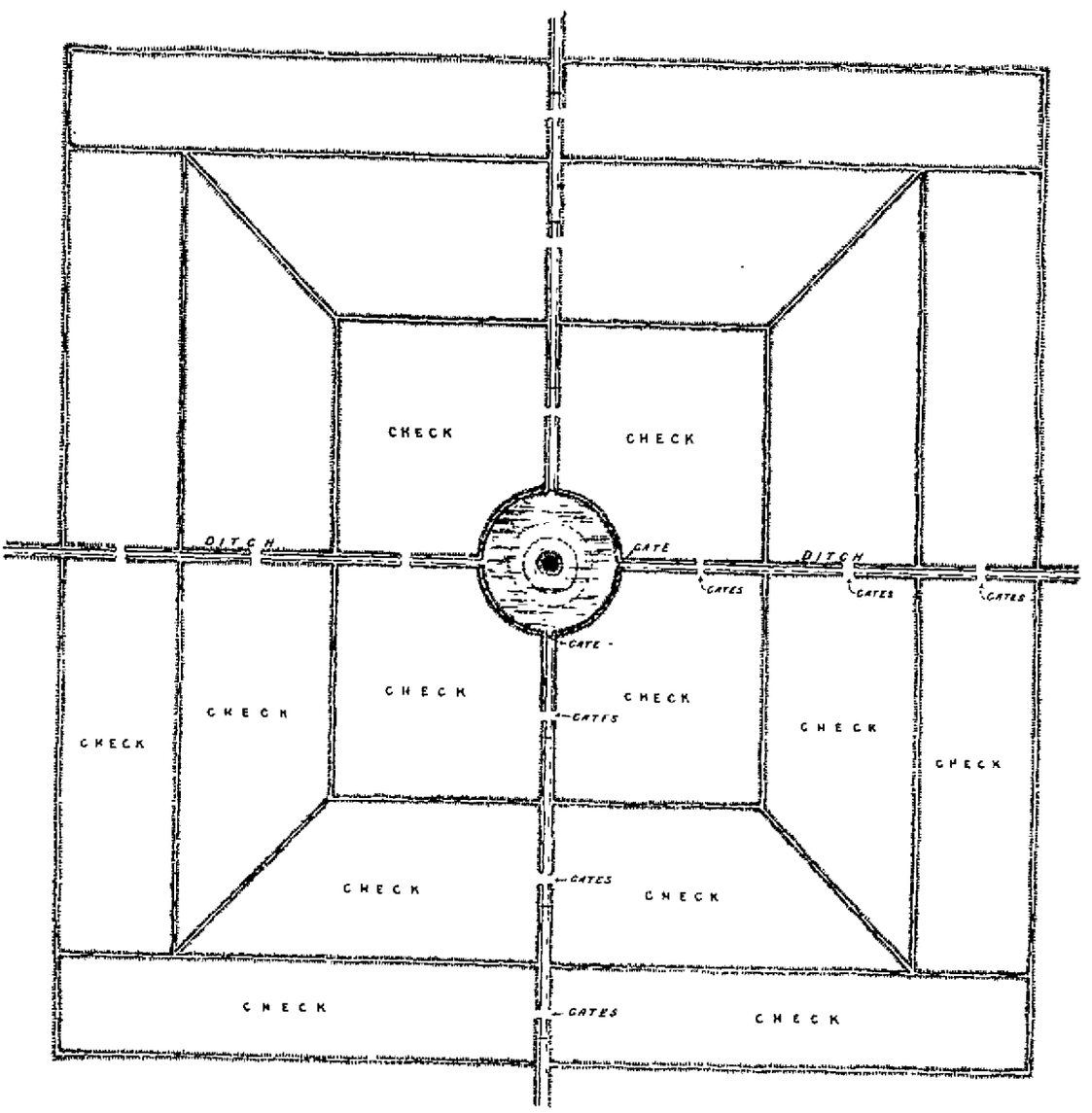
Plate X

SKETCH SHEWING THE APPEARANCE OF A FLOWING WELL
WITH THE SURROUNDING RESERVOIR FOR IMPOUNDING THE WATER

C. W. Darley
M. Inst C.E.





SKETCH PLAN SHEWING RESERVOIR ROUND A FLOWING WELL
AND AN ARRANGEMENT OF CHECKS AND DITCHES
FOR IRRIGATING ABOUT 100 ACRES FROM ONE WELL

SCALE

FEET 200 100 0 200 400 600 800 FEET

JOHN J STONE DELT

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APPENDIX J 3.

GILLESPIE TOOL COMPANY—MANUFACTURERS OF DRILLING MACHINERY AND TOOLS, PITTSBURGH, PENN'A., U.S.A.

An all-wise Providence has placed within the reach of man, no matter where situated upon the habitable globe, the means of procuring an abundance of pure, fresh, and health-giving water.

In the great deserts of Egypt, during the late Arabi Pasha and English war, necessity and Yankee invention developed the fact that an abundance of pure water could be obtained wherever needed. The great African desert has been pierced and yields up the *aqua pura*, and it is a settled fact that fresh water can be procured anywhere through its vast extent by the use of machinery at a nominal cost. French engineers have sunk a hundred wells in this desert, which yield 600,000 gallons of water per hour, and bring under a high state of cultivation a large space of land.

The great American desert, extending from Dakota in the north to the Rio Grande in the south, including the staked plains of Texas, have been discovered by the U. S. Bureau of Agriculture to be underlaid with a great abundance of water for household, stock, and fire department purposes, and for irrigation. In many sections of the United States water is held in a pervious formation, communicating with the snow-capped mountains of the north and west, and wherever that pervious formation is tapped by the drill the water flows above the surface, and there is no place in the country where water will not rise in the drill-hole to within an easy pumping distance from the surface.

Manufacturers and brewers in all cities are learning that it is cheaper to drill wells at their works than to pay the exorbitant license for the uncertain supply furnished by waterworks. Most of the brewers of New York have already drilled artesian wells. The Waterloo Woollen Manufacturing Company of that place have a well flowing 9,000 gallons per hour; at the U. S. Mint, Philadelphia, is a well 450 feet deep that flows 90,000 gallons per day; at the Belshar Sugar Refinery, St. Louis, is another that flows 108,000 gallons per day; another at Louisville, Ky., that flows 330,000 gallons per day; a well drilled at Grennelle, France, flows 21,000 gallons per hour; another at Passy flows 62,000 gallons per hour; Pesth, Hungary, has a well flowing 17,000 gallons per hour; London, England, has a large number of flowing wells, and artesian wells are now being made in all civilized countries. In California it is estimated that there are over a thousand artesian wells, averaging 125 feet in depth, most of which are flowing. Flowing wells have been drilled at Fargo, Dakota, Prairie du Chien, Wis., Pueblo, Col., Ft. Worth and Dallas, Texas, Lake Charles, La., Coolidge, N.M., and in many places in Mississippi, Alabama, and Georgia, and every well drilled creates a demand for more.

The pioneer of our country is excusable for depending upon seep springs and branches for his supply of water, for he is generally without the means of sinking deep wells and the water has not been contaminated; but as the country becomes settled the seep springs dry up, and the ponds and branches become receptacles of liquid filth and offal, breeding an effluvia laden with malaria, poisons, and the germs of disease, which account for many a tear-moistened grave and early wrecked constitution. As the water in the ponds and branches becomes more filthy and unpalatable the water-cart is resorted to and the liquid is hauled from spring or larger body, often many miles distant, where the poison can be gotten in milder doses for family use, while the domestic animals are left to their choice to drink the poisonous mixture from the cesspools or suffer from thirst. The same laws of health apply to man and beast, and any good stock-raiser knows that pure fresh water is one-half of the requirements for the growth and satisfactory development of his stock.

We herein describe the means of procuring water at any point desired, without resorting to the pick, shovel, and fuse, or the risk of being buried alive or suffocated by foul air.

Oil, Coal, Minerals.

Previous to Col. Drake's tedious experience in sinking the first oil well, near Titusville, Pa., in 1858-9, nearly all wells and prospect holes for coal and minerals were made by the old slow, dangerous, and expensive process, requiring the workmen to go down into the well, at the constant risk of life and limb. The discovery of oil developed a necessity for a quicker, safer, and more economical method of sinking wells, and the result has been the invention of many devices for the purpose, but up to this date the Pennsylvania Drilling Machine made by us is the only rock-drilling outfit made that is adapted to the purpose of drilling through rock, and the only combined earth-excavating and rock-drilling machine in existence. There are many so-called combined well augers and drilling outfits in the market, but in all cases they consist of two complete machines, with the exception of some few minor parts that are interchangeable. To claim that such an outfit is a combined machine is absurd, for no one machine can impart a rotary motion to an earth auger and a vertical motion to the drilling tool.

A combined machine for making wells in earth as well as rock must use the same mechanical movement in the earth-excavating as in the rock-drilling, and the Pennsylvania Driller is the only outfit in existence that accomplishes that great desideratum.

The simplicity, portability, and lightness of our machine make it specially adapted to the sinking of prospect holes in a mountainous or distant country, where more cumbrous outfits could not be used, and the item of freight is no small object.

Warranty.

The Pennsylvania Driller, made by us, is warranted to be well made, of good material, free from defects in workmanship, and to do as rapid work in earth and rock with as little draft on the team or engine, as any other earth-excavating and rock-drilling machine in the market, or the purchase money will be refunded.

Our Terms of Sale.

It frequently occurs that patrons are abundantly responsible for the price of an outfit but have not the ready cash to pay for a machine, but can pay one-half the amount at the time of purchase and give good security for the balance with interest until such time as they are able to make the money by sinking wells by contract. To such we would say, send in your orders, and state the time required and the security offered, and if satisfactory we will accept and fill your orders in their regular order. Unless the party purchasing is known by us to be responsible, or can give satisfactory security, we shall require payment in full on delivery under the terms of our warranty.

A Good Investment.

In all neighbourhoods there are many persons engaged in threshing by contract, the majority of whom own portable engines; to such we would say, that by purchasing either our light outfit No. 1, or our No. 2 heavy outfit, you can use your engine to operate our Pennsylvania Driller out of threshing season, and make more money every day you run it than you can with our separator in its best season. There are always plenty of your neighbours wanting new wells or their old ones made deeper, and every drilled well made creates a demand for others, so that the more wells you drill the more you will have to drill.

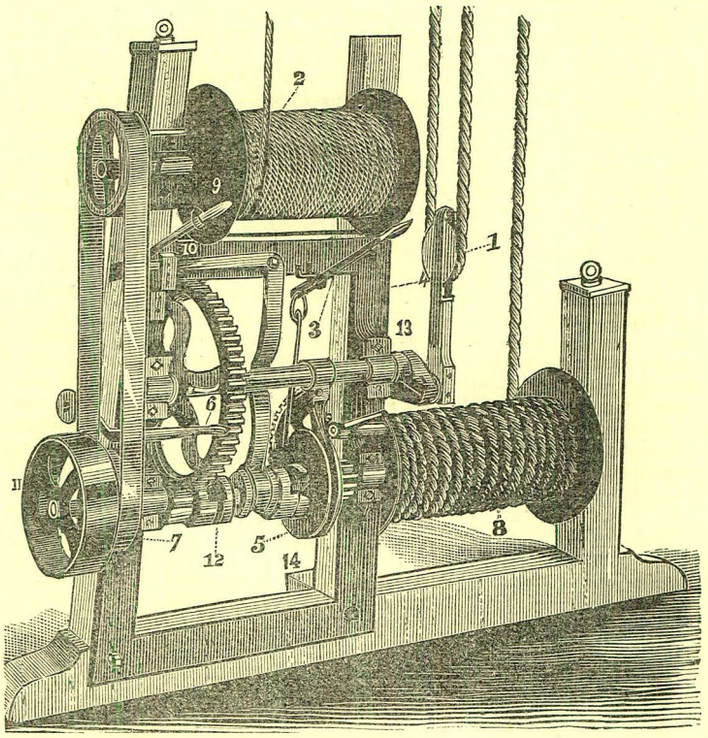
There are over twenty portable drilling outfits in this country on shallow wells for water, and the operators have more work contracted for at good prices than they can do in the next six months.

How the Farmer can make more Money during the Winter than at Farming in Summer.

Between farming seasons there is a time when the farmer has a good deal of capital invested in work-horses that nearly "eat their heads off" while they are doing nothing to earn their feed. If such a farmer owned one of our light drilling outfits with a sweep power to put his horses to work on, he would profitably employ the capital invested in his horses as well as the machine; and many who have tried it have found the business so profitable that they now rent out their farms and follow the drilling business as a more agreeable and profitable occupation. Our horse power is well adapted to general farm purposes, such as sawing stove wood, grinding apples for cider, shelling corn, cutting fodder, and grinding chop-feed, as well as drilling, so that many a large farmer and stock-raiser would find it profitable to own one of our outfits, whether he drilled for others or not.

Why small Wells are better than large ones.

There is a very general opinion among parties who have not studied the matter closely that a well of small diameter will not contain water enough to supply their demands in time of a drought, and think a well of large diameter will hold a surplus to draw upon at such a time. Now everybody knows that if the supply of water is limited, the surplus is soon exhausted, even from a large well, and no matter how large the hole, it is impossible to obtain more water from it than the conditions of the ground or rock surrounding it will furnish; and it is very evident that a deep small hole will penetrate more water-bearing formations than a large shallow hole, and the small hole will as effectually drain the water-bearing formations as the large one; and no matter how few gallons of water may seep into the small well, it can be pumped out without becoming muddy. A well 5 feet in diameter, containing one barrel of water has the bottom covered only 3 inches deep. A well 1 foot in diameter, with the same quantity of water, is filled 7 feet from the bottom, and a well 5 inches in diameter 29 feet. It is too well known how filthy the bottom of a large well becomes to mention it here. As the water fails, the dregs are stirred up, and drained and stirred again; but a small well, securely curbed with cement, tile, or terra cotta curbing, is always mud and rat proof, and even a small quantity of water in it is always pure and wholesome. A 5 or 6-inch drilled well can be made much deeper, for the same outlay, than a large one; and the deeper the well the less liable it is to be affected by drought, as the subterranean watercourses are never affected by surface or atmospheric conditions.



Illustrated Cut of the Pennsylvania Driller, showing the mechanical details, the different parts numbered and described below.

No. 1 is the Pitman sheave.
„ 2 „ „ sand reel.
„ 3 „ „ brake lever.
„ 4 „ „ bedplate, to which the working parts are attached.
„ 5 „ „ brake pulley and hoisting pinion.
„ 6 „ „ sand reel lever.
„ 7 „ „ sand reel pulley.
No. 8 is the drum for drilling cable.
„ 9 „ „ lever for throwing the clutch in and out of motion.
„ 10 „ „ lever support.
„ 11 „ „ driving pulley.
„ 12 „ „ clutch.
„ 13 „ „ crank.
„ 14 „ „ stirrup for holding derrick pole.

The Pennsylvania Artesian Well-drilling Machine.

The drill jack is built independent of the derrick. The jack is a strong wooden frame built of hard wood, with all the machinery, crank motion for drilling, driving shaft, hoisting rig, feed work, and sand reel all neatly fitted and fastened thereto. The derrick consists of two poles or timbers, jointed at the top and fitted with crown pulleys ready for the drill rope and sand-line. To connect the derrick to the jack, lay the jack down on its face, then enter the tenon on lower end of derrick pole into the stirrup on the jack and shove it into the stirrup, then put the bolt through top of the jack and put on the guy rods and connect the derrick at the top, after which it is ready to raise. In raising it, two men will take hold of derrick pole and walking right up with it until the derrick is as straight as desired. When the derrick is in position, put in the cable line and tools, and your machine is ready for work.

How to put on the Cable.

First take the coil of drill rope and find the outside end of it and rivet on your rope socket, after which take the other end of the rope and put it over the crown pulley on top of derrick. Draw it down along the mast to figure 4 (see above), and put it through the sheave toward the direction of fig. 1, and from there over sheave midway in the derrick and thence down to the drum (fig. 8), fastening it to the drum or the flange on the drum by means of a bolt through the flange. One man will then take hold of the drill rope and the other man starts the machine by the lever (fig. 9); draw the pin out of the lever support (fig. 10) with one hand and lower the lever with the other hand until the drum starts, and when the rope is all on, raise the lever above the first hole and put the pin in the lever support (fig. 10), and this stops the drum.

To start the Drilling Motion.

Raise the lever (fig. 9) as high as you can and put the pin in the upper hole of lever support (fig. 10), and you start the drilling motion. To stop it, draw the pin and place it in the lower hole of lever support (fig. 10) and drop the lever (fig. 9) on the pin, but your engine or horse-power may still run on. The lever (fig. 9) is used for starting and stopping the drill, and for raising the tools out of the well. The lever (fig. 6) is for raising and lowering the sand-pump, which will be seen by the cut. Fig. 3 is the brake lever for lowering the tools in the well.

Fig. 5 is the brake pulley and feeding device attached; you will find the holes in the side of the brake pulley. A small iron rod, pointed, is sent along with each machine; this is used to insert in the holes in the feeding device, and is called the feed lever. To lower the tools, put the feed lever in the holes and bear down until the pawl is loose or detached from the wheel or drum, then bear down on the brake lever (fig. 3) and draw out your feed lever, raise the pawl, after which raise up on the brake lever until the tools descend into the well; when they are at the bottom of the well, drop the pawl and commence drilling.

How

How to commence a Well.

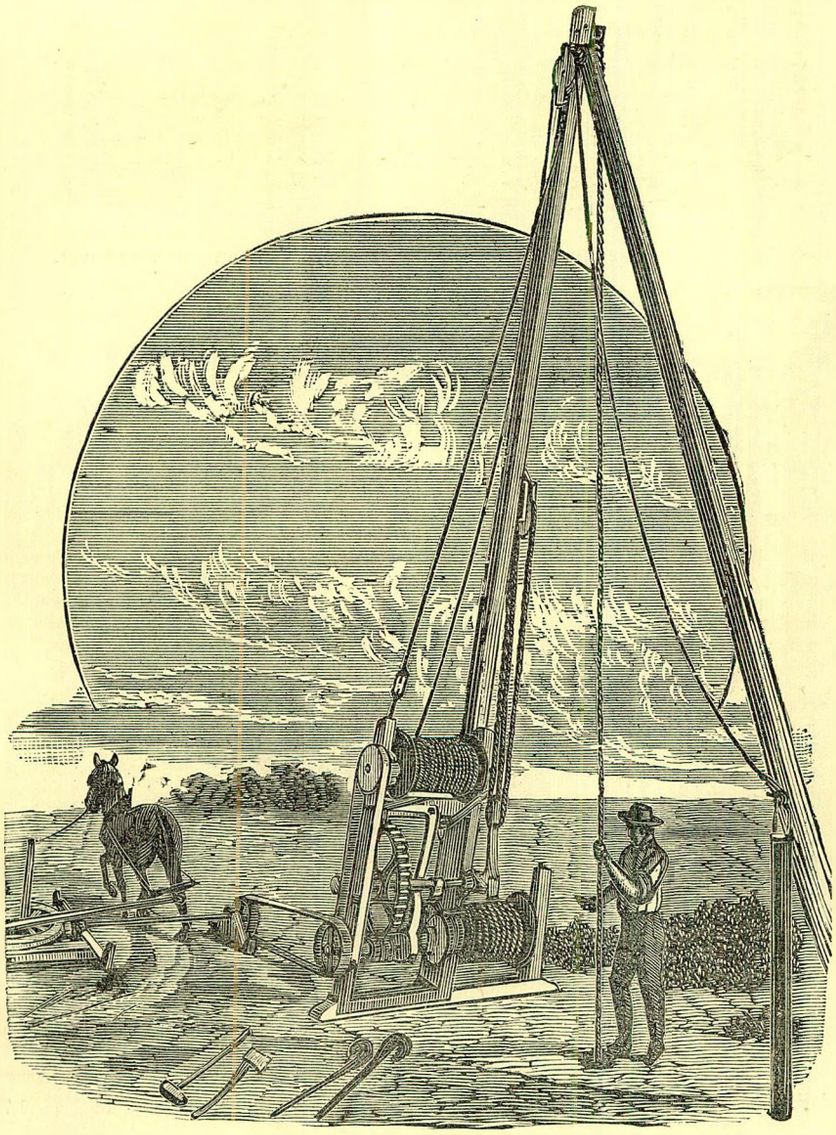
Should the rock be below the surface and you should have to drive pipe, connect the rope socket, auger stem or drill bat and the bits together (leaving the jars out). Then raise the tools high enough to admit of your joint of pipe, and plumb or steady the pipe with the tools and fasten it temporarily. Make a cap from a block of wood, made so as to fit into the socker of the pipe, and bolt this block of wood to a piece of iron, and insert this in the upper end of the pipe. When this is done, take the bolt out of the crank on the driller, and this gives you the "drop motion" of the machine. One man should steady the tools, while the other man starts the machine, and commences driving the pipe. As the pipe descends at each blow you will gradually let out rope, just as it is required by the pipe going down. Continue driving the pipe as long as it will go down; when the driving becomes difficult, remove the cap from the pipe and lower the tools down inside of the pipe; start your machine again just as you did when commencing to drive pipe, and begin drilling. Pour in a few pints of water, so it may mix with the dirt, take hold of your drill rope, and turn a little at every stroke of the tool; continue pouring in water and drilling until your tools commence to rub or stick a little; then draw your tools and run down your sand-pump and clean out; then start your tool again and drill again until you are within about 6 inches of the lower end of the pipe, after which you will commence to drive your pipe again. In no case drill below the bottom of the pipe until you are satisfied you have come to rock, after which you will dress your bits exactly to the gauge, and be sure and always have them fit the gauge. Drilling in the rock is like drilling in the pipe; you can drill until your tools commence to stick or drag a little, when you should draw the tools at once and sand-pump. Always use the jars when done driving pipe, for it is the safest and most practical way of drilling; without the jars your tools may stick, and you may not be able to get out. Please follow the instructions, and you will have better success with your work, and the machine will give greater satisfaction.

To Load and unload the Machine.

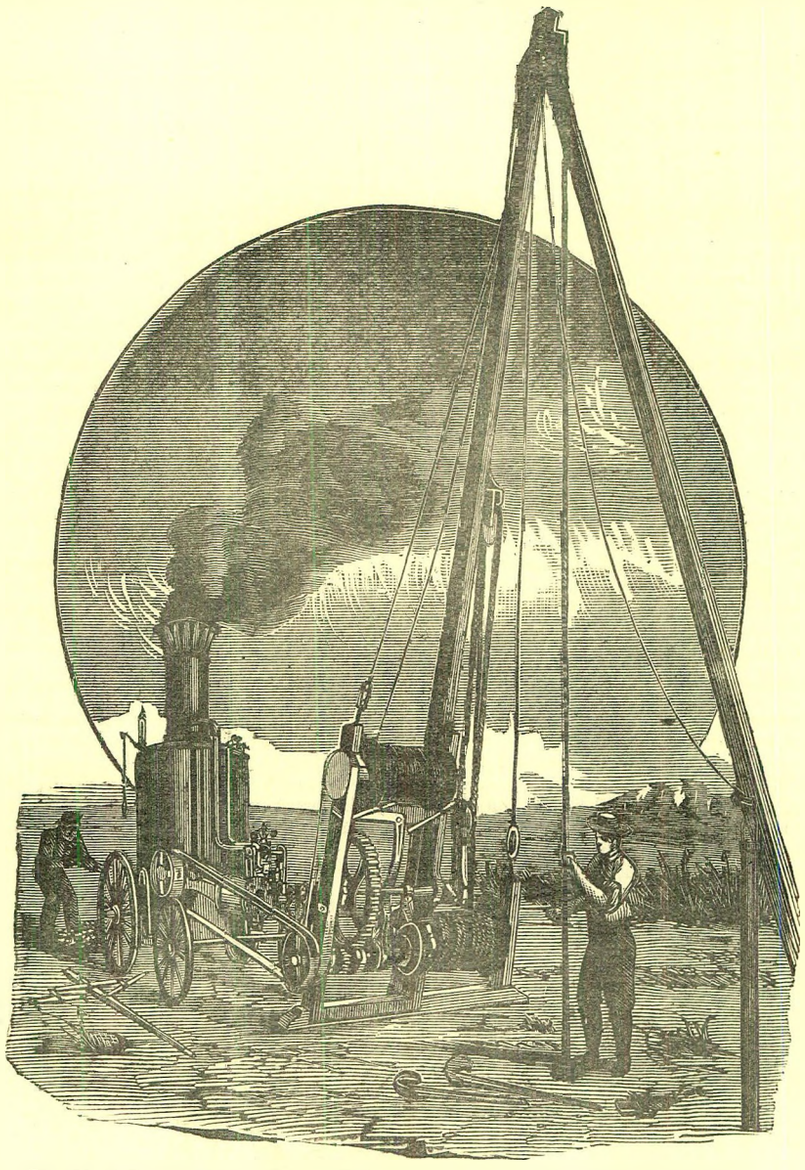
Every machine is provided with trucks, inserted in the base of the machine, so that it will roll quite easily on a plank lengthwise. After you have disconnected the derrick from the jack, back your waggon up close to the jack, and take off the hind wheels and lay them down on their face, directly under the spindles of the axle. This, of course, lowers the hind end of your waggon close to the ground. Take two pieces of plank, and lay one end of each on the waggon and the other end on the ground. Now take hold of the jack and roll it in the waggon near the front end and lay it down on its back; after this is done, take hold of one wheel and raise it up so it will slide on the spindle, and do the same with the wheel on the other side of the waggon, and your jack is loaded. Put in the two poles or derrick, horse-power, and your tools, and you are ready to move. Unload the machine in a similar manner. Two men should do this inside of one hour.

Steam or Horse-power.

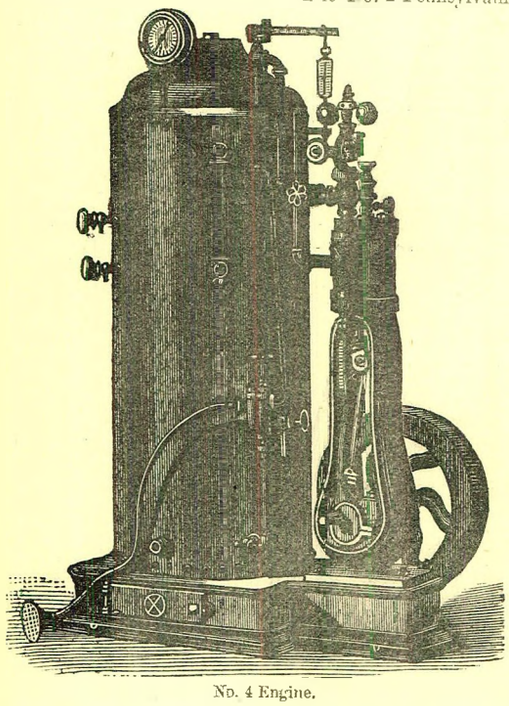
The "Pennsylvania" can be run by steam or horse-power, and we claim that we can drill as fast with either steam or horse-power as any rock-drill manufactured. But we do not wish any person to think they can do as much work with horse-power as with steam-power, for the simple reason that when a man buys a steam outfit it is an engine from 6 to 10 horse-power, and when he buys a horse-power it is generally for one or two horses. You may receive circulars from other manufacturers that will state how fast their machines will drill with horse-power, making it as speedy as steam-power; but if you will stop and think for a moment, you will see that it is false and calculated to deceive, for the reason, you cannot do six horses' work with two. It makes no difference what machine you have; if you will apply as much horse-power as you do steam-power you will surely do as much work, but the expense will be greater.



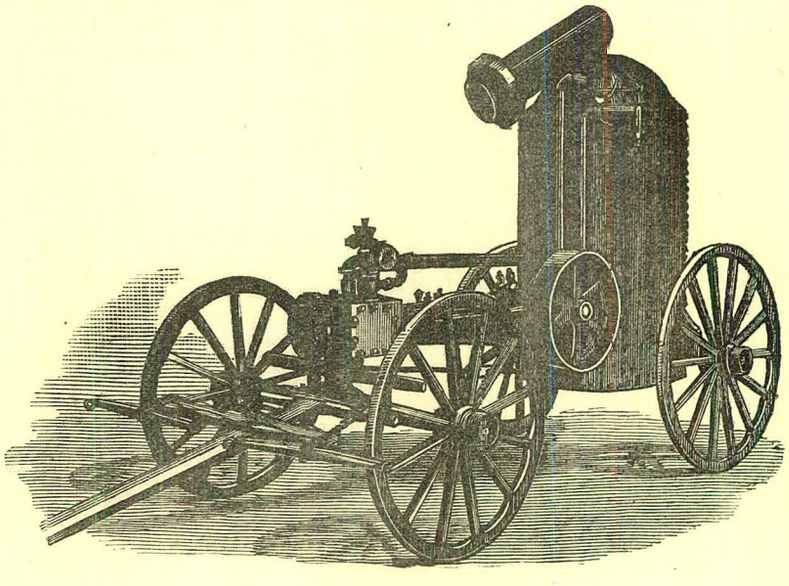
The No. 1 Pennsylvania Driller. To be operated by either horse or steam power.



The No. 2 Pennsylvania Driller. To be operated by either horse or steam power.



No. 4 Engine.

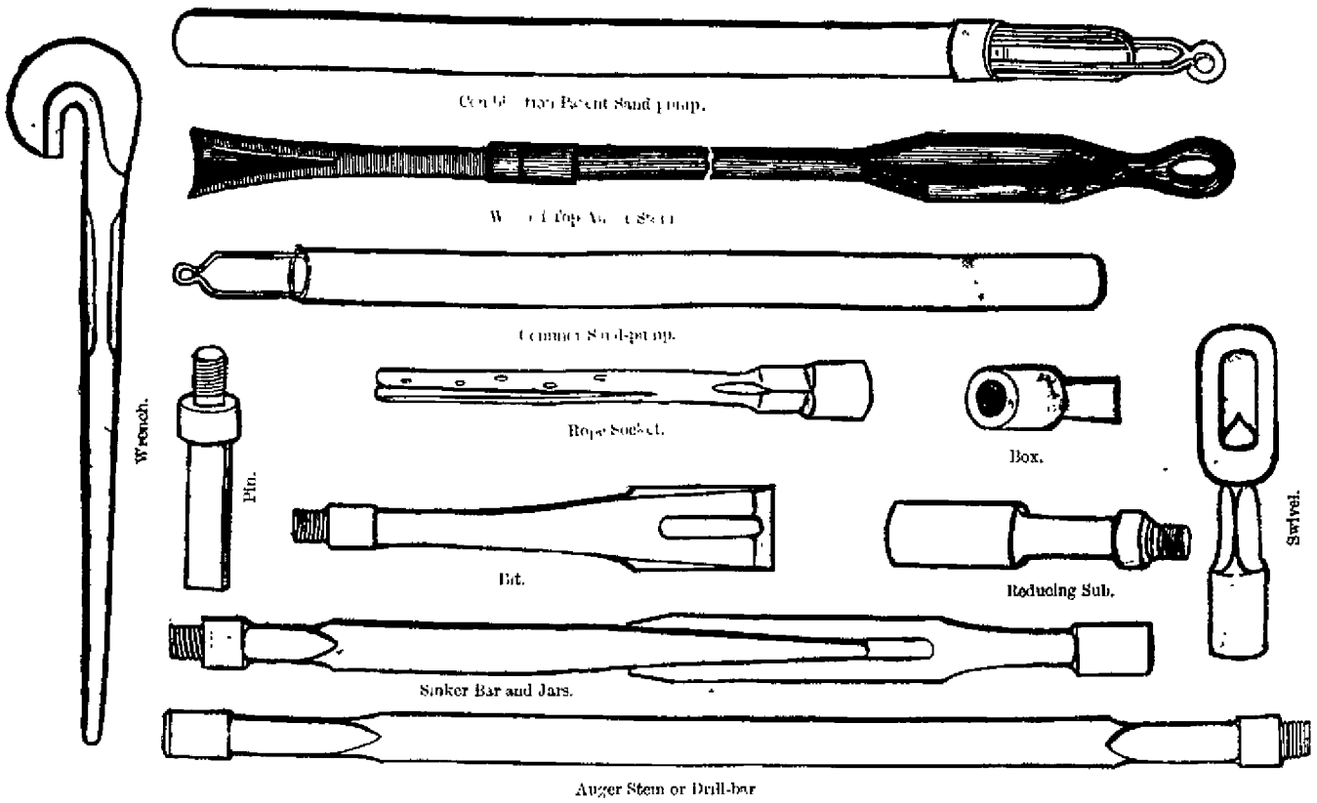


No. 6 Boiler.

Portable Engines and Boilers.

	Diameter of Cylinder.	Stroke.	Revolutions.	Size of Fly-wheel.	Height to top of Boiler.	Diameter.	Dimensions of Fire-box.	Number of 2½ in. flues.	Total Weight.	Horse-power.	Price.
No. 4.....	4-inch	5-inch ...	350	20 inches...	48 inches ...	26-inch ...	20 × 20	14	1,700	4	$450 00
No. 6.....	6 „	8 „ ...	250	24 „ ...	60 „ ...	36 „ ...	42 × 30	21	3,000	8	850 00

DRILLING TOOLS.



PRICE LIST OF WELL-DRILLING MACHINERY AND TOOLS.

No. 1.—Machine with pulleys all ready to bolt on woodwork, for horse or steam power	$350 00
Derrick and woodwork extra	25 00
No. 2.—Machines with pulleys all ready to bolt on woodwork, for horse or steam power	400 00
Derrick and woodwork extra	25 00
No. 1.—Outfit with derrick, 1 rope socket, 1 auger-stem, 1 set jars and sinker-bar, 2 bits, 2 wrenches, 1 sand-pump and horse power, 200 feet cable and sand line. (We guarantee this machine to drill 150 feet)	500 00
This outfit with No. 4 engine and boiler, same as on page 42	1,000 00
No. 2.—Outfit with derrick, 1 rope socket, 1 auger-stem, 1 set jars and sinker-bar, 2 bits, 2 wrenches, 1 sand-pump and horse power, 500 feet of cable and sand line. (We guarantee this machine to drill 500 feet)	650 00
This same outfit with No. 6 engine and boiler, same as on page 42	1,300 00
Hawser-laid drill ropes and sand-pump lines furnished at manufacturers' prices.	
Auger stem, 3-inch round, 10 feet long, with box, jars, and eye for drill rope	45 00
Sand-pump, 3 to 4 inches, 5 feet long	6 00
„ 4 to 5 „ „	7 00
„ Combination Patent, 3½ to 6 inches	15 00
Drill wrenches, for ordinary drilling tools, each	6 00
„ for heavy „ „ „	12 00

Special tools made to order, and repairing done on short notice. Fishing tools of any character made to specification.

PRICE LIST OF OIL AND ARTESIAN WELL TOOLS.

Auger-stems and Sinker-bars with Box and Pin.

Diameter in inches.	2	2¼	2½	2¾	3	3¼	3½	4
Length, 10 feet	$23 00	$27 00	$30 00	$33 00	$35 00	$37 00	$40 00	$67 00
„ 12 „	25 00	29 00	33 00	37 00	39 00	43 00	44 00	75 00
„ 14 „	27 00	32 00	36 00	39 00	42 00	47 00	50 00	82 00
„ 16 „	29 00	34 00	38 00	42 00	46 00	51 00	54 00	88 00
„ 20 „	35 00	38 00	42 00	46 00	52 00	56 00	62 00	100 00
„ 24 „	40 00	43 00	46 00	52 00	60 00	65 00	72 00	115 00
„ 28 „	.....	.....	52 00	58 00	65 00	71 00	80 00	125 00
„ 30 „	.....	.....	55 00	62 00	69 00	78 00	85 00	135 00
„ 33 „	.....	.....	.....	.....	.....	.....	91 00	.....

Drill-bar 12 feet, 1¼ inch round, $14 00; 1½ inch round, $15 00.

Drill-bits, Jars, &c.

Club, flat or Z bits, 4 inches, 20 lbs. steel	$24 00
„ „ 5 „ 25 „	28 00
„ „ 6 „ 60 „	35 00
„ „ 8 „ 70 „	40 00
„ „ 3 „	18 00
Round or half-round reamers, same price as bits.	
Extra amount of steel used in new tools, per pound	30
Re-steeling bits or reamers, per pound, for steel used	40
Plain jars, 1¼ inch reins, Norway iron, with box and pin	35 00
„ 1¼ „ „ „	40 00
„ 1½ „ „ „	43 00
Plain, steel-lined jars, 1½ inch reins, Norway iron	$115 00
„ slab jars, for 5⅛ hole	115 00
Light, plain jars, for working through tubing	15 00
Winged rope socket, with box	15 00
„ „ without box	10 00
„ Substitute, 5 to 5⅛ inch, box and pin	80 00
Reducing sub	14 00
Light horn socket	12 00
Heavy „	30 00
Box stub, 2¼ inch, $6 00; 2½ inch, $7 00; 2¾ inch	8 00
Pin „ 2¼ „ 5 00; 2½ „ 6 00; 2¾ „	7 00

APPENDIX K 1.

On Wells in Liverpool Plains, by Mr. T. K. Abbott, P.M., Gunnedah. Read before the Royal Society of N.S.W., 3 November, 1880.

Some few years ago, at the request of my friend Mr. Russell, I was induced to institute a series of inquiries with the view of ascertaining the depth at which the underground springs may be relied upon as permanent in the district in which I reside. I regret that I met with but little success at first, and found existing in the minds of the proprietors of runs a disinclination to impart the information desired. Gunnedah being nearly centrally situated in the Liverpool Plains, and the general character of the plains in the interior of this Colony being somewhat similar, I thought that if I could obtain reliable data as to the depth at which water was found in wells throughout this district, it would be a fair index of what might and probably would occur in other parts of the Colony where the surroundings were like. So little success did I meet with, and so slowly did the information I required come to hand, that this paper which should have been completed and read in 1877 has dragged "its slow length along" to the year 1880. Indeed, on many of the stations in this district I am mainly indebted to the free-selectors for whatever information I possess.

With a view of making the inquiry as complete as possible, I caused to be printed the following paper, which was distributed throughout the district :—

1. Name of station?
2. Position of well, parish and portion?
3. Size of well?
4. Character of surface?
5. Notes of all strata passed through, including thickness and character to first water?
6. Quantity and quality of first water, also remarks on its appearance, *i.e.*, how it came—in rock, gravel, or otherwise?
7. Like account of strata and water to bottom of well?
8. Dip and amount of strata?
9. State instances (if any) which have come to your knowledge where brackish water, having been first struck, has been passed through, and fresh water found?
10. Instances of the reverse (if any) within your knowledge?

The object of these questions was to obtain reliable facts as to the flow of water beneath the surface of the earth. It is well known that rivers taking their rise in the mountains flow for many miles and are eventually lost in the plains. If it could be ascertained beyond doubt that these rivers may be reached by well-sinking or boring it would impart confidence in the permanence of the springs. I believe the area of the watershed of which the water passes Bourke, the Darling, Namoi, Barwin, Gwydir, and all their tributaries, is about 140,000 square miles. The average rainfall at and about Bourke would be 16 inches; thence towards the main range it gradually increases until the high stations have about 40 inches. "In Queensland, from which the Darling at Bourke drains very largely, the rainfall," Mr. Russell says, "would, I should think, be fully 40 inches." Estimating, however, the rainfall throughout at 16 inches, and reducing it over this large area in the usual way for evaporation and soakage, and in order to avoid the possibility of error reducing what remains by one-half, the river at Bourke *should be* 200 feet deep and 200 yards wide, and flow all the year round! At Bourke the river *is sometimes* nearly dry. Where, then, does all this water go?

It is with a view of assisting as far as I can over a limited area towards decisively solving this problem that I have undertaken the collection of facts regarding wells in this district. I can only at present supply a paper upon wells in the county of Pottinger. The information I possess respecting any other of the counties in this neighbourhood is of too meagre a character to submit.

I have obtained, by means of the forms I had printed and circulated, information regarding about 100 wells in the district of Gunnedah, and accompanying this paper I have prepared a plan showing the position of over ninety wells scattered over an area of country amounting to upwards of 2,000,000 (two million) acres. Those who have visited Liverpool Plains are of course aware that the largest and richest of the far-famed pastoral principalities are situated in this county. The plains are generally level; black soil; here and there isolated basaltic ridges of no great elevation; islands of timber and scrub, and sometimes sandstone formations occur.

The object I had in view in preparing the map showing the position of the wells, the general features of the country, and in the schedule attached giving the depth, strata, and all the information I possess, was to place before the members of this Society thoroughly reliable data—so far as it goes—upon which those more able than I may build up theories. My mission has been only to collect *facts*.

I cannot begin better than by giving a description of one of the most remarkable wells in the district, No. 20 on the plan. It is at Bando head-station, at an elevation, I should say, of 100 or 150 feet above the plain. The country is basaltic; and immediately behind the well rises a range of mountains from 1,000 to 1,600 feet higher than the myall slope upon which the well is situated. The late manager, Mr. W. T. Keene, has obligingly furnished me with the following :—"Size of the well, 7 feet square; character of soil at surface, pipeclay; strata, unknown. This well is 90 feet deep, and has 90 feet of water in it. Its history is rather interesting. Prior to the timber being sapped in its immediate vicinity, it was with difficulty that a team of bullocks could be watered. This was about thirteen years since, and during the late drought the well has overflowed continuously." I have frequently examined this well myself, and quite recently I was promised by the present manager the quantity of the overflow. The information has not, up to the present, I regret to say, been furnished. I should estimate the flow, however, at about 20 gallons per minute, and in thirteen years this would amount to sufficient, if conserved, to form a lake 4 feet in depth and 32 acres in extent. The character of the ridges is, as I have stated, basaltic; sparsely timbered with box and ironbark; and in addition to the remarkable overflow of this well which succeeded the ring-barking, several of the little previously dry watercourses are now trickling rills, and convey away from the range, in one instance at least, quite treble the quantity of the overflow from the well. Whether this remarkable state of things is occasioned by the sapping of the timber, or whether it occurs through the operation of natural causes, I am not prepared to state; but it appears somewhat remarkable that the well should have existed for several years, and the watercourses retained their normal condition for a period extending over thirty years, only to develop into permanent springs and streams when the eucalypti were destroyed.

Instances of Salt Water.

Bearing upon question 9 in the form supplied, although not exactly in answer to it, Mr. Keene states :—"I knew of an instance on Colly Blue (Colly Blue is on Coomoo Coomoo Creek, *vide* plan) where an old well 65 feet caved in. The water in this well was limited and very brackish, and hardly fit for stock. A new well was sunk 12 feet to the east of the old one, and at 33 feet a bed of sand was pierced, and an unlimited supply of excellent fresh water obtained." This fact appears to me to be valuable, as it would prove that the water below the surface is held in channels, and may be obtained at very short intervals under widely varying conditions. In the well which caved in the water was obtained at 65 feet, brackish, limited, and unfit for human use. In the second, only 12 feet distant, water, excellent in quality and unlimited in supply, was obtained at 53 feet.

Beyond Bando head-station, and situated on the side of the same range of mountains, there are two remarkable springs called Tambar. These springs are about 100 yards apart, 4 miles from the plain, and elevated above it somewhere over 200 feet. In one the water is contained in a deep cup-like cavity in an otherwise dry and stony-looking spot, and flows across the main road from Boggabri to Coolah. The outflow from this spring varies considerably with the state of the weather. On bright sunny days the flow is only about 120 gallons per hour, and on a dull, cloudy day (although no rain may be falling) the outflow sometimes reaches 400 gallons per hour. The second spring is situated about 40 feet lower than the one just described, and the outflow averages 1,200 gallons per hour. I carefully examined the range, and could not discover the existence of any sufficient catchment from which these springs might derive their supply. My observations lead me to the belief that the fountain-head is situated many miles from where the springs break forth. Upon the plain in front of Tambar some wells have been sunk 100 feet deep without obtaining water. Tambar is elevated over 200 feet above the plain, and the water flows from the surface.

At Bomera head-station there is a well, not numbered on the plan, only 6 feet deep, where the water almost always remains level with the surface, and the supply is practically inexhaustible. This well is distant about 12 miles in a south-westerly

westerly direction from Tambar, and is situated in a sandstone formation on a slope about 200 yards from a creek, the bed of which is 40 feet lower than the water in the well, and this creek is frequently dry. Some of the land in the vicinity has been cleared, but very little sapped. It appears to me to be similar in character to the spring at Tambar, and the fountain-head must, as in the other case, be many miles distant from where it flows. To the north-west of Bando there is a most remarkable spring at Garrawilla head-station, and upon a recent visit I availed myself of the opportunity to measure the outflow. I found that this spring yielded the enormous quantity of 9,600 gallons per hour. I rode over the spring where it makes its first appearance, and was surprised to find the ground quite hollow for a space of upwards of 100 acres, and upon listening attentively one could hear the sound of rushing water under foot. In many places there happened to be large fissures or holes in the ground, and the water could be seen rushing along on its subterranean course at a depth of about 3 or 4 feet from the surface. A large dam has been erected below this spring, and one of the most extensive sheep-washing establishments in the Colony is supplied with water by powerful engines from this dam. The whole area of the valley in which the spring arises does not exceed 2,000 acres, and the yield per annum at the rate quoted amounts to nearly eighty-five millions of gallons of water. There can be no doubt whatever that the source of this spring is far removed from the drainage area of the valley in which it occurs.

On Moredevil Station, near the source of Cox's Creek, many years ago, a well was sunk to a considerable depth. The exact depth I have been unable to ascertain, but believe it was about 80 feet. No sign of water was obtained before this level was reached, when, as the workmen broke through some hard rock, the water rushed in so rapidly that they were compelled to abandon their tools and make good their escape by means of a rope and windlass. In a few hours the well was filled to within 10 feet of the surface. Some years ago, as the well just described exhibited symptoms of caving in, another well was sunk about 80 yards easterly from the first. This well is 100 feet deep, and is situated higher on the slope by 4 or 5 feet than the first well. When the bottom was reached the water came as rapidly as on the first, and rose to within 4 feet of the surface, and on the following morning the first well had overflown, and a strong stream amounting to upwards of 300 gallons per hour was flowing from it. This has continued ever since, through all varieties of seasons, without cessation. I have obtained from Mr. Williams, the present manager of Moredevil, the following statement, which I cannot do better than give in his own words :—"I have measured the rate at which the water rises in both wells. The first is 6 feet × 6 feet, and I think 80 feet deep, and is situated within 20 yards of a spring, where as a rule the water is on the ground. This is the well which overflows. January 5th, took out 5 feet of water; rose 30 inches in 50 minutes. January 6th, took out 20 inches of water; took two hours to fill again. January 28th, took out 4 feet of water; rose 25 inches in 60 minutes. February 14th, took out 7 feet of water; rose 18 inches in 30 minutes. The above measurements were all made in fine weather. In rain, or in cloudy weather, the water rises very much faster. You will see that, after taking out about 2 feet of water, the water rises much more rapidly than it does at the higher level. This is the case with both wells, as you will perceive by the following: No. 2 well, 10 feet × 8 feet, about 100 feet deep, situated about 80 yards from the spring, and the same distance from the spring, in an easterly direction from both. The water in this well stands about 4 feet below the water in well No. 1. South of this, about 20 yards, limestone is on the surface, and the ground rises gradually. On the lower ground below both wells, pipeclay is, I may say, on the surface; the depth to which it extends I don't know, but it is several feet. Water rises as follows: January 5th, took out 2 feet of water; the first 13 inches rose in 1 hour and 45 minutes; then 2 inches in 60 minutes; the remaining 9 inches at the rate of 1 inch per hour. January 8th, took out 1 foot of water; rose 1 inch per hour."

I have given Mr. Williams' statement exactly as it is written, and its value as a record cannot be doubted. My labours would have been considerably lessened, the results expedited, and my facts enhanced in value, had all the persons to whom I applied for information been as obliging as the late manager at Bando, and the managers of Bomera, Moredevil, and Trinkay. To those gentlemen my best thanks are due for the information they so promptly afforded.

It appeared strange to me that the weather should so much affect these wells and springs; and in turning the matter over in my mind I thought I had discovered the solution in the fact that on bright sunny days the trees must evaporate an enormous quantity of moisture, which upon dull days would be retained or rather not drawn from the earth. In the case of the springs at Tambar and Garrawilla, which must have their fountain-head far distant from where they appear, and the wells of which Mr. Williams gives the description, a little reflection will show that the cause of this alteration in the outflow cannot be ascribed to the influence of the vegetation. The springs at Tambar are on the side of a mountain, and 300 feet from the summit; and the springs in the wells at Moredevil are found at depths respectively of 80 feet and 100 feet, a depth to which no ordinary roots would penetrate.

Coomoo Coomoo is a station situated upon a creek of the same name, and there are a few remarkable wells upon it, which unfortunately I have not been able to fix upon the map. Near the head station there are two wells on the creek about 10 feet above its bed, and the water rises in each to within a foot or two of the top. The creek is often dry. Lower down there is another well, not far from the same watercourse, which makes water at the rate of nearly 7,000 gallons per hour. Coomoo Coomoo Creek, as will be observed by the map, flows out on the plain, and in wet seasons forms Goran Lake, a sheet of water some 25 to 30 miles round. This lake, which comes into existence during very wet seasons, and sometimes lasts for several years, forms in what appears to be a depression in the plain, the borders of which are markedly defined by a ridge of sand. The depth of the water varies from 3 to 7 feet. Several miles to the south-west, Trinkay scrub, celebrated for its ironbark forest, is situated. The soil is of a loose, sandy character, and almost anywhere in the scrub good water can be obtained at a depth of from 13 to 20 feet. Its elevation is 50 to 60 feet above the lake, but the water held in reserve in the scrub never finds its way to the lake, as wells have been sunk between the two without finding water in any considerable quantity.

The well numbered 59 on the plan is situated on Wondoobah, and as will be seen by the Schedule flows over the surface. It is sunk at the base of a conical isolated hill, to a depth of about 60 feet, and at an elevation above the level of the plain of 120 feet. It has continued to flow for fourteen or fifteen years. Well No. 57 on the plan is about 5 miles from No. 59, in a direct line between the latter and the plain, and about 100 feet lower. This well is described as follows :—"6 feet by 4 feet; first 100 feet red soil, with gravel layers containing fossilized bones; teeth of diprotodon found at 100 feet; from 100 feet to 150 feet all red clay; then 3 feet of drift containing little fresh water; 3 feet of clay same character, then boulders and gravel; 3 feet of whitish clay strata dipping slightly to the west." The total depth of this well is 159 feet, and as the surface is 100 feet lower than well No. 59 this would place the bottom 259 feet below the level of the flowing well above described.

With regard to the possibility of finding brackish or salt water passing through it, and then obtaining a supply of fresh, my informants generally assert that instances have come within their knowledge of such cases. Well No. 86 (which is marked upon the plan, although it is in the county of Buckland) affords a remarkably good illustration of this. The description shortly is as follows :—"90 feet deep; at 50 feet salt water came in large quantities; at 90 feet unlimited supply of perfectly pure water in 5 feet of sand." Well No. 68 on plan is another illustration of the same experience. The description given me is :—"Size of well, 7 feet 6 inches by 7 feet 6 inches; 41 feet deep; 6 feet of black soil; 9 feet blue clay; 17 feet whitish clay and gravel; 7 feet of sand; 2 feet loose water-worn stones and sand mixed; first water at 25 feet, in clay and gravel; supply limited; quality hard and brackish; water at bottom fresh; supply abundant." I have no information of instances of the reverse, *i.e.*, fresh water being found first and brackish afterwards, and most likely for the reason that as soon as fresh water is struck well-sinking ceases.

The watershed and general appearance of the country is about the same for the Mooki River and Cox's Creek. The plains extend some 30 miles from one to the other past Lake Goran, but in other places the fall is sharply defined by low scrubby ranges and abrupt basaltic mountains. The plains on each are generally the same loose black soil, in moderate and good seasons producing an abundant and luxurious vegetation. With twenty-five wells on the western watershed of the Mooki, I find the average depth to be 46½ feet, and the average depth of water in each well 13¼ feet. In forty wells on the eastern watershed of Cox's Creek, extending over nearly 70 miles, I find the following averages: Depth of well, 70 feet; depth of water in well, 18 feet. The average of twenty-four wells on the western watershed of Cox's Creek is as follows: Depth of well, 62 feet; depth of water in each well, 22 feet. I may here mention that west of Cox's Creek, at a distance of 10 miles or less, loose sandy soil is encountered, and water, I am credibly informed, can be obtained almost anywhere at from 10 to 20 feet from the surface. A sandstone formation extends to the Castlereagh, and is covered with perhaps the grandest ironbark forest in the Colonies. Of the eighty-nine wells situated on the western watershed of the Mooki and the eastern and western watersheds of Cox's Creek, the average depth is 63 feet 6 inches, and the depth of water for each well is 17 feet 6 inches. From one end to the other along Cox's Creek an unlimited supply of good water may be obtained at an average depth of 50 feet. Of the eighty-nine wells of which I have spoken as lying on the watershed of Cox's Creek and the Mooki, I find that seventy-three bottomed in sand or gravel with an abundance of good fresh water; six bottomed in clay, with water brackish or salt;

eight on rock with hard water to brackish; one in sand, with water bitter; and one in rock, with water good. The average depth of these last sixteen wells I find to be 90 feet; three of them reaching the depth of 170, 159, and 130 feet respectively. It will be observed from these facts that water may be obtained at a moderate depth in sand or gravel almost anywhere in the county of Pottinger. Of course I am aware that the information I have been able to collect is only a small drop in the bucket of knowledge required before generalization can be indulged in. If, however, I am right in believing that Liverpool Plains bear a close similarity to all other of the great plains of the interior, it would be fair to assume that whatever may be successfully accomplished here may also be reached in other districts.

The methods adopted for drawing water from many of these wells, even at the present day, are in many instances of the most primitive kind. An implement known by the name of a "whip" is not infrequently used; a long pole fastened midway in an upright forked stick, and with a weight attached to one end and a bucket to the other, suspended over the well. By pulling upon the rope the bucket is lowered into the water, and then releasing it, the weight on the opposite end of the pole serves to elevate the water. Many thousands of sheep are watered in this manner. Signs, however, of an awakening to the benefits of civilization are becoming apparent; and on three or four stations wind-engines are already erected and doing good work.

Of the economic value of wells so large as those generally sunk I entertain grave doubts. The only benefit that I can see to be derived from a large well is where the vein of water is weak and a large soakage surface is required; where, however, as in most of the wells of this district, the supply of water is inexhaustible, the superior value of a small well properly tubed would soon be manifested. I have very little doubt that with boring machines, wells 16 inches in diameter could be made (and at one-tenth the cost) which would supply the place of any of the large wells. In most good wells the water shows a tendency to rise to the surface, and in some cases does actually rise and flow over. If wells were bored and tubed so that the water if it did rise could not escape through layers of sand or the fissures in the various strata, the chances of having flowing wells would be considerably increased. At any rate, in attempting to solve the problem, "Where does our rainfall go?" boring machines must be called into requisition, and it may happen, when our store of general knowledge has been added to by information similar to that which I have endeavoured to place before this Society to-night, collected from all parts of the Colony, the vast interior plains about the Darling may be rendered as profitable and productive as any other of the more favoured portions of this great land. Lieutenant Maury, in his celebrated work on "Oceanic Currents," begins with the startling sentence, "There is a river in the ocean." It may fall to the lot of some member of our Royal Society to exclaim at no distant date, "There are rivers in the earth," and, with the assistance of those who are in a position to render it, to indicate their locality, the depth at which they may be found, and how rendered serviceable to mankind.

POSTSCRIPT.—The map which accompanies this paper has been kindly prepared by Messrs. Goodwin, Licensed Surveyor, and A. P. D. Hamilton, Land Agent; its accuracy may therefore be relied upon.

SCHEDULE.

No. on Plan.	Size.	Depth to water.	Depth of water.	Total depth	General particulars.
1	..	..	6	6	Bomera Station; in sand; 6 ft. deep, with an unlimited supply; surface undulating.
2	..	54	24	78	Black soil flat; black soil 8 ft.; red soil, 10 ft.; 6 ft. blue rock; water 6 ft from top of rock; short supply.
3	..	10	10	29	Black soil flat close to creek; black soil 4 ft.; red soil 15 ft.; gravel 10 ft.; water in gravel, abundant.
4	..	8	10	18	Red soil flat; red soil 10 ft.; gravel 8 ft.; good supply; water in gravel, abundant.
5	..	62	20	82	Red soil; Appletree Flat; 77 ft. red soil; 4 ft. 8 in. sand; water in sand, inexhaustible.
6	..	68	15	83	Red soil; 78 ft. red soil; 4 ft. 6 in sand; plentiful supply, fresh water
7	..	12	10	22	Black soil flat near Bundella Creek; black soil 6 ft.; red clay 10 ft.; cemented gravel and large boulders 6 ft.; plenty.
8	..	15	10	25	Red soil, Appletree Flat, red soil 8 ft.; clay 10 ft.; cemented gravel and boulders, very hard, 7 ft; inexhaustible.
9	..	37	20	57	Box flat, red soil close to Tamilies Creek; red soil 20 feet; yellow clay 10 feet; cemented gravel 9 ft.; abundant supply.
10	..	12	10	22	Black soil, box flat; black soil 10 ft.; red clay 10 ft.; cemented gravel 5 ft. 6 in.; good supply, fresh water.
10A	..	23	7	30	Black soil flat; black soil 6 ft.; red soil 6 ft.; cemented gravel and boulders, very hard, 10 ft.; abundant water.
10B	..	23	7	30	Box flat; red soil 20 feet; clay 10 ft.; cemented gravel 9 ft.; good supply, fresh water
11	..	30	4	34	Black soil plain; black soil 5 ft.; red soil 25 ft.; gravel 4 ft.; plentiful supply fresh water.
12	..	29	3	32	Black soil plain; black soil 5 ft.; red soil 24 ft.; gravel 3 ft; plentiful supply, excellent water.
13	..	40	30	70	Edge of black soil plain; red soil 30 ft.; sandstone rock 40 ft. into gravel; plentiful supply, excellent water.
14	..	10	10	20	In bed of Coxe's Creek; sand 20 ft.; excellent water, grand supply.
15	..	35	40	75	In watercourse of Coxe's Creek; strata unknown; water in sand, excellent quality, good supply.
16	..	55	20	75	Black soil, old watercourse; strata unknown; water in gravel; will water 10,000 sheep; excellent and unlimited.
17	..	4	77	81	Level plain; stiff black soil 4½ ft.; gritty sand 5 in.; reddish soil 29 ft.; sand 20 in.; 51 ft. clayey marl; water in gravel; good; at 80 ft. found kangaroo bones and bivalve shells.
18	..	31	2	33	Level plain; sandy loam 31 feet; pure sand 2 ft.; water like sea-water; mineral smell disappearing on exposure to air.
19	..	55	20	75	Black soil, on edge of lagoon; strata not known; excellent water, unlimited supply.
20	..	..	90	90	Pipeclay at surface; strata unknown; overflowed thirteen or fourteen years ago in consequence of ringbarking.
21	..	65	5	70	Even surface; clayey black soil; strata unknown; water slightly hard, came in rock.
22	..	15	15	30	Undulating surface; stony black soil; quality of water fair, came in stones and gravel.
23	..	22	36	58	Level surface; black soil; plenty of water; slightly hard; came in clay and gravel.
24	..	80	8	88	Black soil plain; black soil 6 ft.; loam 24 ft.; 8 ft. pure sand; quantity unlimited, quality excellent.
25	..	55	15	70	Black soil, myall country; black soil 15 ft.; hard blue rock 65 ft.; water not abundant or good.
26	..	45	15	60	Open plains; black soil 55 ft.; 5 ft. sand; water fresh; supply unlimited.
27	..	55	15	70	Open black soil plains; black and red soil 70 ft.; sand 5 ft.; supply inexhaustible.
28	..	55	15	70	Same as last.
29	..	55	15	70	Same as last.
30	..	55	12	67	Black soil plain; black soil 67 ft.; bottomed in soft sandstone rock; supply excellent
31	..	60	20	80	Black soil 70 ft.; soft sandstone 10 ft.; from top of sandstone water supply excellent.
32	..	55	15	70	Same as 27.
33	..	55	15	70	Same as 27.
34	..	116	14	130	Black soil 130 ft.; reddish clay 10 ft.; supply limited and not good.
35	..	60	10	70	Black soil 60 ft.; drift 10 ft.; water supply not very good.
36	..	50	20	70	Open plain; black soil 40 ft.; sand 10 ft.; supply excellent.
37	..	60	10	70	Ironbark country; black soil 65 ft.; sand 5 ft.; supply excellent.
38	..	60	10	70	Same as 37.
39	..	55	15	70	Same as 37.
40	..	2	8	10	In sandstone country; sand 10 ft.; water supply inexhaustible, quality excellent.
41	..	55	15	70	Exactly similar to 27.
42	..	55	15	70	Exactly similar to 27.
43	..	51	15	66	
44	..	40	20	60	
45	..	40	20	60	
46	..	55	15	60	
47	..	51	14	65	
48	..	55	15	60	
49	..	70	10	80	Edge of open plains; black soil 50 ft.; rock 10 ft; clay, gravel interspersed 15 ft.; sand 5 ft.; water rose 60 ft.
50	..	125	5	130	Edge of plain; reddish clay; strata unknown; water supply not good.
51	..	50	14	64	
52	..	50	10	60	Plain; 16 ft. black soil; 1 ft. red sand; 5 ft. black soil; 1 ft. 6 in. red sand; 12 ft. black soil; 20 ft. flint and rotten sandstone with layers of clay; water slightly brackish; improving.
53	..	80	20	100	Open black soil plain; water in sand; supply unlimited.
54	..	160	10	170	On island of timber in plain; light red soil 10 ft.; hard blue rock 160 ft.; water supply not good; through joints of rock.
55	.	94	10	104	Forest country; clay 60 ft.; 30 ft. decomposed schistose rock; 2 ft. lignite; 50 ft. basaltic rock; spring in veins of hard bluish rock; limited.
56		90	10	100	Forest country; red soil; clay interspersed with drift sand 100 ft.; 10 ft. of water, very bitter, in fine drift sand and clay; improves with use.
57	.	147	12	159	Box forest; 100 ft. red clay and gravel layers containing fossilized bones; teeth of Diprotodon at 100 ft.; 50 ft. red clay; 3 ft. drift with fresh water; 3 ft. clay and then 3 ft. whitish clay and boulders.
58	..		60	60	Black soil; 120 ft. above level of plain; strata unknown, black soil and clay and then gravel and boulders; water flows over top of well; very good.
59	..	..	30	30	Stony forest; strata unknown; well 30 ft. deep with 30 ft. of water; came in slate, and larger supply in gravel.
60	..	41	30	71	Black soil; 7 ft. black soil; 64 ft. rotten rock, hardening as sinking proceeded; excellent and good supply of water; came through fissure in rock.
61	..	110	10	120	Light gravelly soil; strata unknown; limited supply brackish water, unfit for human use; stock drink it warily.
62	.	77	10	87	Black soil plain, 76 ft black soil, traces of lime and bones; 3 ft. gravel; 8 ft. limestone and gravel with water; water good, about 5,000 gallons in twenty-four hours.

No. on Plan.	Size.	Depth to water.	Depth of water.	Total depth.	General particulars.
63	..	16	24	40	Limestone formation, 12 ft. loose soil ; 4 ft. limestone boulders ; water good ; not a strong spring in gravel and boulders.
64	..	44	3	47	Black soil, old watercourse ; 32 ft. black soil ; 10 ft. reddish clay ; 3 ft. stones and boulders ; water in boulders and gravel, limited.
65	.	..	..	57	Old watercourse ; 12 ft. black soil ; 20 ft. jointy blue rock ; 25 ft. hardrock ; small stream in jointy rock ; no water at bottom.
66	..	85	51	136	Black soil 1 mile from a mountain ; 40 ft. black soil ; 10 ft. stones and gravel ; 30 ft. red soil ; 5 ft. cement ; 51 ft. limestone boulders and gravel, water in these
67	..	84	6	90	Open downs ; limestone and red soil 84 ft. ; brackish water ; (several wells have been sunk around this, all as salt as the sea) near Lake Govan.
68	..	25	16	41	Open plain ; 6 ft. black soil ; 9 ft. blue clay ; 17 ft. whitish clay and gravel ; 7 ft. sand ; 2 ft. waterworn stone and sand ; first water brackish at 25 ft. ; water at bottom excellent.
69	..	20	5	25	Open plain ; 9 ft. alluvial black soil ; 6 ft. blue clay ; 10 ft. sand ; water fresh, abundant.
70	..	28	12	40	Open plain ; 12 ft alluvial black soil ; 16 ft. whitish clay and gravel ; 12 ft. of sand ; water fresh and abundant.
71	..	19	5	24	Rich black soil plain ; 10 ft. black soil ; 14 ft. sand ; rock at bottom ; water in sand, unlimited.
72	..	40	1	41	Open plain ; 12 ft. black soil ; 28 ft yellow clay ; 1 ft. sand ; first water in sand salty, now good.
73	..	21	18	39	Rich black soil plain ; 10 ft. black soil ; 11 ft. sand ; water at 21 ft. slightly brackish ; 18 ft. fine drift sand ; water abundant, fresh.
74	..	22	8	30	Rich black soil plain ; 12 ft. black soil ; 10 ft. whitish clay and gravel ; 8 ft. sand ; water in sand ; fresh, supply abundant.
75	..	24	13	39	Open rich plain ; 10 ft. alluvial black soil ; 12 ft. whitish clay and gravel ; 15 ft. sand ; first water in sand ; fresh, supply abundant.
76	..	15	8	23	Rich open plain ; 10 ft. black soil ; 15 ft. sand and mussel shells ; 1 ft. red clay ; water very salt and bitter.
77	..	41	11	52	Box and rosewood forest ; alluvial soil loam 4 ft. ; 20 ft. red clay and gravel ; 10 ft. sand ; 11 ft. drift and gravel ; 1 ft. red clay , water very salt and bitter.
78	..	25	1	26	Rich black soil plain ; 10 ft. black soil ; 15 ft. sand and mussel shells ; 1 ft. red clay ; water very salt and bitter.
79	..	29	9	38	Rich open plain ; 9 ft. black soil ; 18 ft. whitish clay and gravel ; 9 ft. sand ; water abundant.
80	..	24	4	28	Rich black soil plain ; 2 ft. black soil ; 12 ft. whitish clay and gravel ; 4 ft. sand ; water in sand, fresh and abundant.
81	..	35	25	60	Open plain ; loam 50 ft. ; drift 10 ft. ; water abundant.
82	..	35	25	60	Open plain ; loam 45 ft. ; drift 15 ft. ; 25 ft. fresh good water.
83	..	35	25	60	Open plain ; 45 ft. loam ; 5 ft. drift , 25 ft. fresh good water.
84	..	35	5	40	Open plain ; 40 ft. loam ; no sand ; water not plentiful.
85	..	30	5	35	Open plains ; 35 ft. loam ; no sand ; water not plentiful.
86	County Buckland.				Myall timber ; 50 ft. reddish clay ; large supply salt water ; 35 ft. clay and gravel ; 5 ft. sand ; inexhaustible supply, fresh water.
87	..	..	.	..	Black soil plain ; black soil 5 ft. ; yellow clay and sand 40 ft. ; sand 4 ft. ; 30 ft. clay ; 8 ft. sand ; water inexhaustible.
88	..	..	..	..	Box timber ; lime, sand, gravel, 5 ft. ; water abundant.
89	..	..	..	.	(In county of Nandewar.)
90	..	.	..	..	Near Dividing Range, Coxe's and Borah Creeks ; about 40 ft. deep ; water supply in sand, abundant.
91	..	..	..	..	On plain ; black soil ; gravel ; sand ; strata unknown ; water inexhaustible, in gravel and sand.
92	..	..	..	..	Box and yellow-jacket forest ; black soil 14 ft. ; gravel 11 ft. ; water inexhaustible.
93	..	..	.	..	Box forest between ridges ; crystal quartz ; limestone ; bluestone ; strata unknown ; water at 20 ft.
94	..	..	..	..	On southern slope of box ridges ; strata unknown ; water in gravel and rock, rose to within 10 ft of surface.
95	.	.	..	..	
96	..	.	..	..	
97	..	..	..	..	
98	.	..	..		
99	.	.	..	..	

Index to Wells shown on Map, Appendix L 3.

Number of Well.	County.	Parish.	Name of Run.	Depth of Well.	Size of Well.	Water struck at feet from surface.	Water stands at feet from surface.	Yield per day in gallons.	Quality.	Height above sea.	Nature of surrounding Country.	Strata.	Remarks.
				ft.	ft.								
1	Arrawatta	.....	King's Plains	70	5½ x 5½	65	65	Never-failing	Brackish	.....	N., granite ridges; E., S., and W., ridges and plain.	Black soil, granite, rotten slaty bottom	This well is only used in time of drought.
2	„	.....	„	90	8 x 4	.....	9	„	„	.....	Forest, plain, and ridges, chiefly white gum timber.	Black soil, rotten granite and pipeclay	Water stands 5′ from the top in wet seasons.
3	„	.....	Swamp Oak	45	6 x 4	.....	21	„	„	.....	N., barren ridges; E. and W., do.; S., forest and ridge.	Top brown soil, then basalt to bottom.	
4	„	.....	„	40	6 x 4	.....	4	„	„	.....	.....	.....	In a wet season overflows.
5	„	.....	Byron	21	4 x 4	20	15	„	Slightly brackish	.....	Black soil plains and open forest country	Black soil 15′, basalt 6′.	
6	Macquarie	.....	Cutarbat	50	Circumference 8	.....	25	.....	Fresh and hard	.....	Undulating, ridges running into rocky mountains.	Black alluvial soil, pipeclay, and slate rock	The well is believed to be down to the level of river water. The water is hard, but used for household purposes.
7	„	.....	Huntington	101	Circumferenee 8	.....	71	.....	Hard	.....	Low ranges, with creeks running to river	Soft slaty rock	Sunk on a low ridge believed to be down to level of river water, used for household purposes.
8	Manara	.....	Kilfera	189	5 x 2½	80	80	50,000	Good stock	.....	Salt bush plains, lignum, S. side	.....	Salt at 80′; got much better as we went deeper; last spring struck almost fresh, 100′ open shaft, 89′ bore, 3½″ diameter.
9	„	.....	„	162	5 x 2½	50	60	Unlimited	Salt	.....	„ „ „	Gypsum, sandstone, and clay	Salt at 50′; improved slightly when bored; open shaft 100′, bore 62′.
10	Franklin	.....	Moolbong	110	6 x 3	.....	100	20,000	Good and fresh	.....	Salt and cotton bush, dark clayey soil	Alluvial	Selection of site for well a matter of chance in some parts of Riverina. Good stock water is obtained at a depth of 100′ to 130′; in other parts two wells within 1 mile of each other salt water was obtained; midway between, another shaft was put down and good water obtained.
11	„	.....	„	250	.....	115 & 250	.....	Unlimited	Fresh	.....	„ „ „	„	
12	Windeyer	.....	Buckalow	150	6 x 4	130	110	24,000	Slightly brackish	.....	Broken plains	Alluvial, 120′ pipeclay and drift 30′	This well is in a sandy box swamp, and gives one of the best supplies in the district; other shafts have been tried in the Mulga country and failed to strike water; two of them sunk 220′.
13	Taila	.....	Mallee Cliff	70	5 x 3	.....	.....	.....	.....	.....	S., mallee and porcupine grass; W., N., and E., black oak.	Loamy soil 15′, drift sand 55′.	
14	„	.....	„	18	5 x 3½	15	12	3,000	Slightly brackish	.....	Pine ridges, mallee, porcupine grass, and salt bush.	.....	This well is covered by the Murray water when in flood.
15	„	.....	Bedura										
16	Wentworth	.....	Gall Gall										
17, 18, 19	Taila	.....	O. B. Turlee										
20	Wentworth	.....	Gall Gall, C.								Red sandy soil or clay on salt-bush plains		One well on Gall Gall, C, we pumped for a considerable time in the summer, hoping the water would improve, but it did not do so. Have several soakage wells, with good stock water, all at shallow depths of not more than 20′, all sunk in the beds of dry creeks where the flood waters back up, and all within 5 miles of the river; the supply is not good, and are only made useful by making large chambers and drives at bottom of shaft.
21, 22	„	.....	West Parengi, A.	75 to 150	.....	.....	.....	.....	Salt	.....	Red sandy soil in belar or oak scrub	.....	
23 to 27	„	.....	Wamberrar								Red sandhills in mallee		
28 to 34	„	.....	Outer Tapio								Red clayey soil in box flats		
35 to 37	„	.....	Outer Tilato								White clay flats, with box timber		
38	Menindie	.....	Burta	280	6 x 3	250	250	Not tested	Good stock	.....	Salt and cotton bush, light scrub, and undulating.	Hard clay, with gravel 100′, alluvial 80′, pipeclay and mica 30′, soft sandstone rock and clay 70′.	Open shaft 200′, bore 80′. This well is to be sunk to full depth of bore, when the supply is expected to increase. A Tiffen borer was used.
39	Windeyer	.....	Mallara	64	6 x 3	64	20	„	Salt and poisonous	.....	Sandhills and oak ridges, like decomposed limestone.	Pipeclay and drift	A good many trial shafts have been sunk on this run, salt water being struck in drift under 100′ in all of them.
40	Perry	.....	Moorara	100	6 x 3	82	82	17,500	Good stock	.....	Open salt and cotton bush plains, with oak clumps, &c.	Alluvial 82′, fine drift 18′	Have sunk fifty trial shafts on different parts of run, from 80′ to 100′; salt water struck in all; unfit for use.
41	„	.....	Pan Ban	100	6 x 3	80	80	Unlimited	Fair stock	.....	Open salt bush plains, with oak ridges, &c.	Clay throughout	50,000 gallons per day have been obtained, but the supply seems practically inexhaustible; slightly brackish.
42	„	.....	North Pan Ban	78	6 x 3	78	75	8,000	„	.....	„ „ „	Alluvial 20′, fine drift 58′	Cool, cloudy weather seems to increase the supply.
43	Rankin	.....	Barnato	150	6 x 3	135	135	5,000	Good stock—Slightly sweet.	.....	Sandstone ridges; red clay flats; mulga pine; beefwood.	Alluvial gravel, cement and sandstone rock	There is a 30′ drive in this well.
44	„	.....	„	200	6 x 3	190	140	7,000	Good stock	.....	Pine sandhill; mulga and belar ridges	Gravel and cement 100′, sandstone 60′, cement and blue clay 40′.	There is a 30′ drive in this well.
45	Woore	.....	Fulham	175	5 x 2½	169	168	3,296	„	.....	Loamy flats, rocky ridge, and mallee sandhills.	Loam, clay, and cement 167′, drift 8′	8 miles from this well a trial shaft was sunk 188′; no water struck; half-mile from the above well a shaft 6′ × 3′ was sunk to a depth of 96′. Then a bore 130′ = 226′, no water being struck; boring still going on.
46	„	.....	Moama	170	6 x 3	170	.....	3,000	Very brackish	.....	Box flats and pine sandhills	Alluvial 100′, sandstone flags 70′, water in blue clay.	
47	„	.....	Baden Park	200	6 x 3	.....	.....	6,000	Good stock	.....	Red clay flats and pine sandhills	Cement and sandstone.	
48	„	.....	Emerald	140	6 x 3	126	.....	.....	„	.....	Open mulga, with ridges of mallee	Hard sandstone 69′, chalk 1′, hard sandstone 70′.	The sandstone rock in this well required to be blasted; it is intended to put a drive in this well to increase the supply.
49	Booroondara	.....	Paddington	200	8 x 4	.....	.....	5,000	Brackish	.....	Ironstone rises; box flats; mulga, &c.	Alluvial pipeclay, cement, and sandstone rock.	
50	Woore	.....	Warfield	220	6 x 3	.....	.....	6,000	Good stock	.....	Red flats and pine sandhills	Pipeclay and cement, hard sandstone.	
51	Blaxland	.....	Bedooba	300	.....	300	115	.....	Good and fresh	.....	Undulating	Blue slate	This well was sunk before present owners bought station. There are two long drives at bottom, not required for use.
52	Mouramba	.....	Priory	230	8 x 4	.....	.....	.....	Good stock	.....	Undulating yarren and box flats and ironstone rises.	Cement and hard sandstone, water in sandstone.	
53	Canbeligo	.....	Booroomugga	100	6 x 3½	.....	.....	.....	.....	.....	Undulating ridges; volcanic hills	Red clay 3′, red sandy drift 4′, coarse red drift 6′, red clay 7′, white sandy rock 10′, pipeclay 3′, white sandy rock 12′, fire-clay 4′, white sandy rock, with occasional thin strata of fire- and pipe-clay, 51′.	This well is not yet finished.
54	„	.....	Girilambone	155½	Bore	155	128	.....	Good stock	.....	.....	Hard sandstone, rock, cement, quartz, and gravel.	
55	„	.....	„	120	Bore	116	105	.....	Very salt	.....	.....	Quartz, gravel, and hard sandstone	A shaft put down here would make 6,000 gallons per day.
56	„	.....	„	100	Bore	.....	.....	.....	.....	.....	.....	Hard slate, quartz, and hard rock, &c.	
57	Ranken	.....	Donald's Plains A	160	6 x 3	.....	133	4,000	Fresh	.....	.....	Pipeclay and cement	This well is in the bed of Tiltagoona Creek.
58	.....	.....	Mount Manara	.....	.....	.....	.....	.....	.....	.....	.....	.....	Government well condemned as being unfit for stock. A well half a mile to the N. W., good water, supposed to be soakage.
59	Booroondara	.....	Donald's Plains I	90	4 x 2½	.....	.....	Limited	Fresh	.....	Cotton bush; mulga rises, and sandstone hills.	Pipeclay, cement, and layers of drift	This well has never been used for stock purposes, owing to a 10,000-yard tank full of water in the vicinity.
60	Cowper	.....	Coronga Peak	120	6 x 3	.....	.....	„	Good stock	.....	Undulating, red, volcanic hills, and mulga.	.....	Not required to be used.
61	Finch	.....	Goondoobline	50	6 x 6	35	35	Not tested	Fresh	.....	Sandy pine ridges, then open box flats	Sand.	
62	Leichhardt	.....	Polly Browan	20	6 x 5	18	10	1,000	Good and fresh	.....	Buthar and pine timbers, small clear patches of salt-bush.	White loose sand	This well was cleared out in the dry time, and it watered the whole of the stock on the place in the summer of 1881 and 1882.
63	Finch	.....	Gingie	25	7 x 7	20	20	Limited	Good	.....	Open, red and black soil	Sand	This well is a simple sand pocket, surrounded by clay, and catches the drainage of the adjacent hard ground; the supply is always limited, and if sunk too far salt water is struck.
64 to 78	Leichhardt	.....	Euroka	45 to 68	.....	.....	.....	.....	Saline	.....	.....	.....	Fifteen bores by machinery on various portions of this station struck water in each of the first sand-drifts met with; further attempts at finding fresh water abandoned.
79	Finch	.....	Dungalear	120	.....	100	80	.....	Salt, unfit for stock	.....	Very level, loamy soil	.....	The only fresh-water wells here are small sand wells, no springs being tapped; would do for household purposes, or (say) 1,000 sheep.
80 to 88	„	.....	„	20 to 40	.....	.....	.....	.....	Fresh	.....	.....	Sand	There are nine sand wells, with only a limited supply of splendid clear fresh water; not sufficient to water any large number of stock; might be made available by having a receiving tank kept full for use in troughing; they are soon pumped dry and take a considerable time to fill again; they are all in sand hollows, and fresh water is indicated by gum-trees growing in vicinity; if sunk too deep a clay bottom is struck, and continued through that for any distance salt water would be struck.
89	„	.....	Llanillo	45	6 x 4	.....	.....	.....	„	.....	.....	.....	
90	„	.....	„	45	6 x 4	.....	.....	.....	Salt	.....	.....	.....	
91	„	.....	„	55	6 x 4	.....	.....	2,000	„	.....	.....	.....	
92	„	.....	„	45	6 x 4	.....	.....	.....	„	.....	Belar and salt-bush plains, loamy and sandy soil.	.....	
93	„	.....	„	40	.....	.....	.....	1,000	Fresh	.....	Sandy basins, box, coolabar, &c.	.....	
94	„	.....	„	60	.....	.....	.....	1,000	„	.....	„ „	.....	
95	„	.....	„	35	6 x 4	.....	.....	600	.....	.....	Fine scrub and box flats	.....	
96	„	.....	„	35	6 x 4	.....	.....	600	.....	.....	Same	.....	
97	„	.....	„	38	4 x 3	.....	.....	.....	.....	.....	Sandy soil, pine scrub, and salt-bush	.....	
98	„	.....	„	60	.....	.....	.....	.....	Salt	.....	Red soil, N.W. plains; S.E. pine ridges	Drift sand.	
99	„	.....	„	50	6 x 4	.....	.....	.....	„	.....	Red soil, ridges, pine, and coolabar	.....	There is a vein of country running from the Moonie River down to the lower Narran Lake, between the Narran and Barwon Rivers; it consists of sandy basins and low pine ridges, where water can be obtained at various depths from 20′ to 40′, in some places salt, in others fresh; on a portion of Llanillo Run there are two wells 30′ apart, one fresh wholesome water, the other barely fit for consumption; the supply influenced by the rainfall.

Note.—A companion map to Appendix L 3, showing longitudinal sections, may be found in the Annual Report of the Department of Mines for the year 1884.

INDEX TO WELLS—*continued.*

Number of Well.	County.	Parish.	Name of Run.	Depth of Well.	Size of Well.	Water struck at feet from surface.	Water stands at feet from surface.	Yield per day in gallons.	Quality.	Height above sea.	Nature of surrounding Country.	Strata.	Remarks.
100	Cowper		Glenariff	109			49		Fresh			Granite	Pumped with an Althouse windmill; waters 20,000 sheep.
101	"		"	209			101		Brackish			"	Pumped 1,500 gallons per hour; mill and pump never without water.
102	"		"	330					Salt			Slate	Boring being continued, a Wright and Edwards' machine being used.
103	Killara			144			Artesian	60,000	Fresh				Rises 26′ above surface in tube.
104	Landsborough			49			"	20,000	"				
105	Mossgiel			360			180		"				
106	"			312					"				
107	Gunderbooka			194	Bore	72′ 6″	10		Salt			Sandstone 40′, clay 24, clay and sand 130′.	Water also struck at 22′, 60′, 64′ 6″, 66′, and 69″, all salt.
108	"			198	"	198	38		"			Sandstone 20′ 9″, clay 39′ 3″, clay, sand, and drift 138′.	Salt water struck at 12′ and 24′. Fresh water at 31′, 32′ 6″, 45′, 53′ and 55′. Salt water struck at 198″, hard sandstone and conglomerate, and rose to 38′ very quickly.
109	Barrona			114	"	80	Artesian	1,440	Fresh			Clays 20′, mud and drift 43′, clays 20′, sandstone 31′.	Salt water struck at 20′; a large supply. Fresh water at 80′, rose 21′ over surface.
110	"			201	"	192	"		"			Clay and sand 82′, sandstone 105′, shale, granite, pebbles, rock, &c., 14′.	Fresh water struck at 80′, 100′, rose 8′ over surface 80 gallons per hour; 107′, rose 8′ over surface; 122′, 6″ over surface, 600 gallons per hour; 192′, rose 10′ over surface.
111	"			474	"	427	"		"				Salt water struck at 110′, rose to within 23′ of surface; 349′, brackish, rose 3′ over surface; 427′, fresh water, rose 3′ 3″ over surface.
112	Pottinger			53	"	40			"			Clay and gravel.	
113	"			25	"	23			"			Clay and sandy loam 20′, drift 5′	Large supply.
114	"			23	"	23			"			Sandy loam and clay 20′, drift 3′.	
115	"			41	"	28			"			Clay, sand, and gravel.	
116	"			60	"	57			"			Clay and gravel 57′, rock 3′.	
117	"			41		38			"			Sand and gravel	Very good water.
118	"			30	Bore	27			"			Loam, clay, gravel, and boulders.	
119	"			48	"	38			"			Sand, clay, and gravel.	
120	"			34	"	24			"			Clay, drift, and clay	Large supply.
121	"			132	"	70		9,600	"			Sand and gravel, clay and rock	Water tapped at 32′, and at 70′; large supply.
122	Murchison		Bingera	80		80			"				Plentiful supply.
123	Courallie	Near Morce		130		130	90		"				
124	Denham		Gorion	174		174	78	24,000	"			Clay, sand, and drift	Salt water at 80′; brackish, 143′; fresh, 174′.
125	"		"	188		164	90	576	"			Ditto, ditto, ditto	Salt water at 80′; brackish at 141′; fresh, 164′.
126	Yancowinna	Near Silverton		40		40			"				150 gallons per day, after striking the water, expected to increase to 1,000 gallons.
127	Delalah		Elsinora	390	Bore	370		Unlimited	"				
128	Clarence			184		126			Salt				Strong supply. Coal struck at 184′.
129	Pottinger			78			54		Fresh		Black soil, flat	Soil 18′, rock 60′	Short supply.
130	"			82		77	62		"			Red soil 77′, 5′ sand	Water in sand inexhaustible.
131	"			81		81	4		"		Level plain	Soil 34′, sand 1′ 8″, marl 45′ 4″	Water in gravel good. At 80′ kangaroo bones and bivalve shells.
132	"			90					"			Pipeclay at surface. Unknown	Overflowed once in consequence of ringbarking.
133	"			136			85		"			Black soil 40′, stones, &c., 10′, red soil 30′, cement 5′, gravel, &c., 51′.	
134	"			60			35		"		Open plain	Loam 45′, drift 15′	Good water.
135	"			40			28		"		"	Black soil 12′; clay and gravel 16′; sand 12′.	Water abundant.
136	"			70			60		"		Ironbark country	Black soil 65′; sand 5′	Supply excellent.
137	"			71			41		"		Black soil	Black soil 7′; rotten rock 64′	Excellent and good supply. Came through fissure in rock.
138	"			40					"				Water supply in sand abundant.
139	Robinson			640		579			"				Bore, 75′ 10″ at bottom of shaft—Cobar Copper Mine. Water in slate.
140	orthumberland	Awaba	Teralba	568	Bore	197	Artesian		"	22		Shale, conglomerate; sandstone and coal seams.	
141	Mootwingee		Morden	153	Bore	153	100		"			Turf, sandy clay, gravelly clay, loose and compact sand and chalk.	Water struck at 47′; small supply; 116 feet larger supply; at 153′ abundant supply, all fresh.
142	St. Vincent			850	Bore		Artesian		"				
143	Cumberland	Gladesville		442	Bore	336	8		"	27		Conglomerate sandstone and shale.	
144	"	"		365	Bore		8		"	27		Sandstone and shale.	
145	Young			255	Bore	218	70		Salt			Clay, drift, and drift sand.	Water also struck at 120′; rose to 70′ at the rate of 70 gallons per hour; at 196½′ also struck, rises to 75′, small supply; at 235′ drift sand, rises 100′ in tubes.
146	"			128	Bore	121	105	1440	Fresh			Sand, clay, and drift	At 111′ good stock water rose to 105′, 720 gallons per day.
147													
148	Young			35					Salt				
149	"		Netallie	104					"			Loam, 9′; clay, 30′; drift, 1′; stones, clay, &c., 47′; sandstone, 17′.	Well 90′, bore at bottom 14′; water poisonous.
150	"			135				19,200	Fresh			Loam, clay, sand, and drift	Good stock water.
151	"			135					"			Ditto, ditto, ditto, ditto	Good stock water.
152	"			404				720	"			Drift, 100 feet; rock.	Shaft 236′; bore 168′.
153	Tandora		Glenlyon	240				20,000	"			Loam, clay, stone, drift, and sandstone.	
154	"			40					"				Soakage water magnesian.
155	Yancowinna			150					"				
156	"								"			Granite formation	Little water, but good.
157	"			80					"				Will water 2,000 sheep. Fair stock water.
158	"	Silverton		100		93			"			Sandy loam and mica slate.	
159	"	"		100					Salt				
160	"	"		100				4,200	Fresh				24′ of drives 10′ from bottom. First 600 gallons only fit for drinking.
161	"	"		14					"				Soakage water. Will water 10,000 sheep.
162	Waradgery		Mungadal	110			65	20,000	"				
163	"		"	108			65	20,000	"				
164	"		"	70			65	40,000	"				
165	"		Illiliwah	137		137	60		"				Good supply; struck small supply at 60′; shaft 90′; bore 47′. Struck large supply at bottom of bore.
166	"		Ulonga	121			86		Salt				
167	"		"	75			65		"				
168	"		"	75			65		"				
169	"		"	110			75		"				
170	"		"	87			75		"				
171	"		"	100			80		"				
172	"		"	110			60		"				Water slightly salt.
173	Urana		T.S. Reserve	141			111	7,500	1st class stock				Supply approximate.
174	Denison		"	131			112	7,500	"				
175	Waradgery		"	90			75	7,500	Brackish				
176	Nicholson		"	94			67	8,000	Salt				
177	Waljeers		"	130			110	10,000	Sweet				
178	Mossgiel		"	140			90	Unlimited	Brackish				
179	Waljeers		"	130			101		1st class stock				Nearly completed.
180	Barrona		Kerribee	200		180			Fair stock				Small supply.
181	"		Wanga Wana	400		20			Salt				Very little water struck at 20′.
182	Killara		Killara	734					"				
183	Baradine	Baradine township		122			108		Fresh				
184	White		T.S. Reserve	76			30	14,400	"				
185	Pottinger		"	101									Not finished. No water.
186	"		"	97									" " "
187	Manara		"	126			97		Fresh				
188	"		"										Not finished.
189	"		"										" "
190	Young		"										" "
191	Yungnulgra		"										" "
192	"		"										" "
193	Yantara		"										" "
194	Tengowoko		"										" "
195	Blaxland		"	167			161	Unlimited	Fresh				
196	"		"	136			118	10,000	"				
197	Sturt		"	107			56		"				
198	Nicholson		"	106			100		"				
199	Franklin		"	135					"				

W. B. HENDERSON,
Superintendent of Drills.

APPENDIX L 4.

TABULATED Statement showing the cost of Bores put down at Bourke, to 1st November, 1884.

No. of Bore.	No. of machines.	Cost of machinery.	Cost of transport.	Cost of working, exclusive of transport and machinery.	No. of feet bored.	Total No. of feet bored.	Time occupied	Rate bored per day.	Cost per foot (working).
		£ s. d.	£ s. d.	£ s. d.	ft in.	ft. in.	dys. hrs.	ft. in.	£ s. d.
A	Water Augers— No. 1. W. & E. No. 2. T. No. 3. T.	2,241 1 4	526 18 2	1,976 3 10	194 4	1,407 11	558 0	2 6½	1 8 0⅞
C					198 3				
B					89 2				
B¹					34 6				
B²					114 0				
B²2nd					103 0				
B³					200 8				
D*					474 0				

* Bore at 57-mile post.

W. B. HENDERSON,
Superintendent of Drills.

APPENDIX L 5.

The Superintendent of Drills to The President of Royal Commission on Conservation of Water, &c.

Sir, Department of Mines, Diamond Drill Branch, Sydney, 30 October, 1884.

In submitting the various drawings and sections of boring-machines and connections other than diamond-drills, together with the accompanying voluminous evidence given in favour of each particular machine, I have the honor to submit also for your consideration the following remarks obtained by the practical working of most of the machines referred to in these drawings and sections.

The first and most important matter to be considered in the application of any particular class of boring-machine is its suitability for the class of work it is to undertake. To arrive at this, it is necessary to be practically acquainted with the nature of the country in which the work is situated. Without this knowledge, the best machines in the hands of the most perfect workmen may be placed in such a position as to prove a complete failure. There have been many instances of this having been experienced in Australia, and frequently the cause, when looked for after bitter experience, is found too late to be remedied.

Imported boring-machines of the supposed best make have been laid aside in this Colony, having been found totally unfitted, though introduced under the most glowing accounts of their performances elsewhere; in fact, there is great harm done to the best interests of the Colony and its most enterprising pioneers by unskilled non-practical advice, and having to depend mainly on the testimony obtained through trade pamphlets issued at the instance of the makers of machines foreign to the wants, stratas, and circumstances of Australia. Such testimonials generally give the exception—the best,—leaving out the failures, the accidents, the delays, and all the bad work. I have had borings carried out under my supervision in this Colony by boring machines (other than diamond drills), in which a depth of 103 feet was bored in twenty-six hours easily and well, more easy than as many inches in the same number of days could be effected by the same appliances in different strata. I have had rocks to contend with in the Colonies practically impenetrable to the ordinary steel percussive applied bit—rocks that I had to draw and sharp bits thirty odd times to penetrate 1 inch; swelling clays, which in the course of one night expanded so as to entirely close up a 6-inch diameter bore; gravel drifts forcing up through the boring-rods, and that, becoming jammed therein, had force sufficient to poise the whole plant off the surface—hanging so—feet in the air.

Swelling clays are the ordinary every-day circumstances, and there is no experience before given which cannot be overcome by practical work and selection of suitable appliances.

A boring-machine suitable for work in medium hard rocks is not suitable for swelling clays, drifts, or alluvial soils, and *vice versa*.

For alluvial soils, sand drifts, and swelling clays, common and peculiar to the western plains of this Colony, percussive motion alone, in my opinion, must prove a costly failure. In this class of country, distant from settlement and workshops, I have found that rotary cutting motion with steel cutters, and adapted to be worked by either horse or manual power, and requiring the least possible quantity of water, made of the best wrought iron or steel, so as to dispense with the objectionable castings so common to imported machines, will alone succeed.

Having arrived at this opinion, not only from personal experience in this Colony, but also from the undoubted and almost daily proofs in the adjacent Colonies, the selection of the best machine is simplified mainly by the consideration of those which are worked on the principle of rotary motion, and of which there are placed before you several varieties.

The most important question which next arises in connection with the use of the several classes of boring-machines is the quantity of water required to work them. In Australia the search for water underground is chiefly carried out in those districts where the supply of water on the surface is very limited—indeed, in some cases, barely sufficient to meet the domestic requirements of the men employed to work the machine. In such a case it becomes a matter of great importance to use the machine which requires the least quantity of water, for the machine which would require the power of an 8, 10, or 12-horse power boiler to work it would be useless in this class of country.

During the late severe drought, when, in order to economize the scarcity of the water supply, horse-power had been used in place of steam, I endeavoured to keep a small party employed at one of these machines, supplied with water by a team of eight horses; I was, however, compelled to fall back on manual labour to work the machine, as I found that the water had to be carried such a distance, the horses used as much water as they were able to draw. In circumstances such as these, it is practical acquaintance with the class of country, together with machine and tubing suitable to pierce swelling clays and drifts, that are likely to meet with success in searching for underground supplies of water, and not machines made in and suitable for foreign countries, worked by men strangers to the nature of country through which they will have to pass before reaching water.

Another matter, which must in all cases be taken into account, is the weight of the machine which is being forwarded to carry out the work, not only on account of the cost of carriage, but also in view of the danger which exists of the machinery becoming bogged *en route*.

As the country is at present, and with the means of transit at present available, it is absolutely necessary that these machines should be as light as possible, consistent with efficiency. The cost of carriage alone, for instance, of one of these machines last year, from one site to another, amounted to £300. This drawback can be rectified as far as possible by the adoption of water-augers made in Australia to suit the circumstances of the Colony and yet capable of attaining the required depths. It will be seen by the official returns which I have the honor to hand you, that the several Australian Colonies have gained considerable experience in this matter of boring for water.

In Victoria, 330 bores have been put down during the year 1883, by the Government alone, in search of water, being a total of 24,403 feet. In South Australia also, twenty bores, 5,479 feet, have been carried out for the same purpose; and in New South Wales, the boring machines under my supervision have put down, up to March last, forty bores, representing 4,516 feet, in twenty-five of which fresh water has been discovered. The discoveries of fresh water would, I believe, be found greater were the bores generally carried deeper, as will be seen by the section of those bores, which show that the salt water is discovered at a shallow depth, almost always above the fresh water.

I specially wish to invite your attention to the sections of several bores put down in the north-west of this Colony, and in the Warrego District, Queensland. I

I also desire to draw your attention to the system of telescoping, which has been adopted in this Colony for some years past, and which has proved to be so effective in shutting off salt or other impure water, as shown in the diagram which I have the honor to submit for your information. This method is so simple and so clearly shown by the diagram that it is needless for me to here explain it. This system has been found eminently successful, not only in combating with swelling clays or drifts as well as salt or impure water, but in giving increased facilities for not only attaining great depths and overcoming swelling clays and drifts, but it gives the proper outlet for the water to flow, or the insertion of deep well pumps, where natural laws require it to be so. The riveted boring-tubes imported from America, and which have been tried, were found to be an utter failure, so much so that large quantities of this class of tubing having been imported, had to be laid aside as useless. Tubes of a superior quality, prices of which I herewith annex, varying in diameter from 7 inches to 2½ inches, have been imported by this Government from Europe, and their success has been so marked that I believe the Governments of South Australia and Queensland are becoming large importers of this class of tubing for the bores being put down by their machines.

With reference to the rock formations, especially those of a hard nature, and where water is available, the diamond drill far surpasses any other kind of borer. The cost of a 6-inch or 9-inch diameter bore, put down by a diamond drill, would not be very much greater than the cost of a 3-inch diameter bore, which is the size commonly used. I beg to refer you to the cost of a bore, 3½ inches in diameter, which was put down 1,003 feet, under my supervision, on the Holt-Sutherland Estate, the whole expenditure from commencement to completion being only at the rate of 4s. 9d. per foot; the general average field cost per foot of boring by diamond drill for the whole year being at the rate of 10s. 3d. per foot.

I beg to hand you a report received by me relative to boring carried out in New Zealand. The borer referred to is that known as the Pennsylvania Oil-rig; an expert from America conducted the work. I reported on this subject last year, and I now respectfully draw your attention to this report and the latest performances.

I further hand a statement of the borings executed in three respective colonies, a table showing comparative cost and speed of the several waterboring-machines under my charge, put to the test in such a manner that there cannot exist a doubt as to which machine is best.

I am clearly of opinion, by the working of several class of borers, that Australian-made machines and workmen, with Australian bush practical experience, are the best means that can be adopted to develop the underground water supplies of these Colonies.

In conclusion, I may mention that there are at present at least five different engineering firms in these Colonies, makers of a variety of boring machines other than diamond drills, and I anticipate at no distant date that machines will be made by such firms capable of fully meeting all the circumstances I have pointed out.

I have, &c.,

W. B. HENDERSON,

Superintendent of Drills.

ARTESIAN TUBING.

STATEMENT of the Diameter, Thickness, and Weight of Artesian Lap-welded Boring Tubes; also showing quantity imported by the Department of Mines to date, and prices per foot.

Diameter (inches).	Thickness wire gauge.	Weight per 1,000 feet.	rice per foot te quotation).	Quantity imported.
		t. c. q. lb.	s. d.	
2	11	0 19 1 9	0 10	
2¼	11	1 1 3 16	0 11	
2½	11	1 7 3 1	1 0	
2¾	11	1 10 2 20	1 1	
3	11	1 13 2 11	1 2	
3¼	10	2 0 3 15	1 3	
3½	10	2 4 0 19	1 4	
3¾	10	2 7 1 23	1 6	
4	9	2 16 0 18	1 8	
4¼	9	2 19 3 6	1 10	
4½	9	3 3 1 23	2 0	11,148½ feet.
4¾	8	3 13 2 8	2 4	
5	8	3 17 1 22	2 8	
5¼	8	4 1 1 7	2 10	
5½	7	4 13 0 15	3 3	
5¾	7	4 17 2 2	3 8	
6	7	5 1 3 17	3 10	
6½	7	5 10 2 18	4 8	
7	7	6 3 3 10	5 0	
8	4	8 10 0 19	7 8	
9	$\frac{5}{32}$ of an inch.	11 10 0 13	10 6	

W. B. HENDERSON.

APPENDIX L 6.

BORE D, 57-MILE POST.

TABULATED Statement showing how the time of the men has been occupied from 18th January to 21st October, 1884.

Moving and erecting.	Boring.	Cleaning and baling bore.	Repairing.	Delays, including holidays.	Sinking supply tank.	Total days occupied.
18 days.	135 days.	54 days.	13⅛ days.	12⅞ days.	5 days.	238 days.

BORE

BORE B 3, 51-MILE POST.

From 24th September, 1883, to 17th January, 1884.

Moving and erecting.	Boring.	Cleaning and bailing bore.	Repairing.	Delays, including holidays.	Total.
9½ days.	75½ days.	1 day.	9 days.	5 days.	100 days.

APPENDIX L 7.

CONSENSUS of Reports on Water Supply received from various Mining and other Companies at Ballarat at dates as under, viz.:—

September 26th, 1884—From J. H. Thompson, Esq., Consulting Engineer to the Ballarat Company, Victoria.

AVERAGE quantity of water pumped (the body of water being at its maximum) was from 2,500 to 3,000 gallons per minute, or from 3,600,000 to 4,320,000 gallons per diem. This enormous supply was pumped steadily for over two and a half years without showing any signs of abatement; mine was at work for twelve years; main body of water did not decrease to any perceptible extent during the two and a half years it was contended with, but it was stopped back by a scheme he devised and put in operation (*vide* Report Chief Inspector of Mines, published in 1877, by the Department of Mines, Victoria, for the year 1876, pp. 9–10). Area of mine was 1,243 acres; shaft sunk to 570 feet; main body of water occurred at 360 feet, in the honeycombed basaltic formation, noted in that Colony for carrying large volume of water. Coursing water at time of leaving off work was about 800 gallons per minute, increasing and decreasing as the mine was opened up; average between 700 and 800 gallons per minute; mining operations were being carried on at some 1,000 feet from shaft when work was stopped; he acted as consulting engineer to a Company at Ararat, which had great difficulty in contending with water; maximum pumped, 4,000 gallons per minute, or 5,760,000 gallons per diem; since fallen off to 1,000 gallons per minute, and still likely to decrease; pumping in this instance was from shallow depth of 180 feet; geological formation of the country greatly affects the supply of water, as instanced that of the Duke Company, Timor, near Maryborough; pumping operations have been carried on for the last ten years; average quantity pumped during this time being about 3,000 gallons per minute; country subject to percolation, no doubt accounting for steady supply experienced.

25th September, 1884—From Robert Sharp, Esq., Ararat.

Maximum number of gallons pumped per day, 5,010,400; pumping has been continued for twelve months; present quantity per day, 1,060,400 gallons; mine has been at work three years; no perceptible increase takes place as more ground is opened up. Area of mine, 200 acres. In this locality the yearly rainfall increases our water. In the City of Ballarat Company, where he was formerly employed, the water in the basalt was tapped at 150 feet; after eight years' pumping the shaft was eventually sunk to 450 feet, when bottom of basalt was reached; water was then puddled back, and very little decrease took place until work was resumed in deep ground with basalt overhead, when, as the ground was opened, the water gradually increased every foot that was driven.

29th September, 1884—From Isaac Wheelden, Esq., Drummond-street, Ballarat, Victoria.

Average number of gallons pumped daily was 2,880,000; mine was at work eight years, water being pumped about six years; area of mine, 2½ × 3 miles square. An account of work done may be found in p. 479 of Gold-fields and Mineral Districts of Victoria, by R. B. Smyth.

10th October, 1884—From R. M. Sergeant, Esq., Manager, Band of Hope and Albion Consols (No Liability) Ballarat.

Area, about 1¼ mile long by ½ mile wide; 20,000 gallons of water per diem raised, during which the three shafts were connected with galleries below, and crossed the gutter in every direction, the water flowing freely for twenty years, but drained at the rate of about 2 per cent. per annum; have sunk 914 feet for purposes of quartz-mining, and found the water comparatively light, and not good for sanitary purposes.

13th October, 1884—From J. M. Mackay, Esq., Manager of the Duke Company, Ballarat, Victoria.

For twelve months 5,000,000 gallons per diem were raised from a depth of 350 feet; during the years 1881, 1882, 1883, and 1884, the volume, of water gradually eased, until, at the date of writing this, 2,650,000 gallons of water per diem were raised; area of mine, 293 acres 2 roods $3\frac{7}{10}$ perches; area worked, 140 acres; area actually taken out (say) 45 acres; area unworked, 153 acres.

W. B. HENDERSON.

TABULATED Statement of Water Supply, taken from Reports received from Mining and other Companies at Ballarat, Victoria, 1884:—

Name of Mine.	Area.	No. of gallons per diem.	No. of years pumping.	Water increasing or decreasing.	Nature of strata.	General remarks.
Band of Hope and Albion Consols, Ballarat.	About 1¼ mile long by ½ mile wide.	20,000 gallons ...	20 years.....	Decreased at the rate of 2 per cent per annum.	Basalt, with intervening drifts, and clays overlying schistoze slates.	
Duke Company, Ballarat.	293 acres 2 roods $3\frac{7}{10}$ perches.	2,650,000 gallons.	4 „	Decreasing at rate of 700 gallons per diem.	Silurian rock...	
City of Ballarat Water Supply Company.	1,243 acres	3,600,000 to 4,320,000 gallons.	2½ „	Stationary* ...	Honeycombed basaltic formation.	* Stopped back by a scheme suggested by the Consulting Engineer.
Grand Junction Ararat Company.	200 acres	(Maximum), 5,010,400 gallons; at present, 1,060,400 gallons.	1 year pumping; 3 years at work.	No perceptible increase excepting after rain-fall.	Not mentioned	
Great North-west Company, Ballarat.	2½ × 3 miles square.	2,880,000 gallons	6 years.....	Increasing.....	Basalt rock ...	

W. B. HENDERSON,
Superintendent of Drills.

APPENDIX L 8.

Mr. J. Rossiter to The Superintendent of Diamond Drills.

Dear Sir, Stockton Colliery, Newcastle, 28 October, 1884.

In answer to your inquiries of the 22nd instant, *re* operations and progress of the South Pacific Petroleum Company, Gisbourn, New Zealand, of which I have been a member of the Board of Directors during the said company's existence:

Boring operations by the above-named company were commenced in August, 1880, from which time up to March 31st, 1884, seven (7) bores were put down, ranging in depth from 100 to 375 feet, or in all about 1,330 feet, under a labour cost of £4,430, or £3 6s. 8d. per foot of bores, exclusive of plant, tubes, &c., the cost of which being £6,650, a very large amount for the work done, and with no other result than that of good indications.

Size of tubes, 8, 6, and 4½ inch, as used in American oil wells. Nature of country gone through, chiefly soft swelling clay, highly saturated and charged with petroleum, paraffine, and explosive gases, also intermixed with beds of loose sandstone boulders at various depths, which in most cases proved fatal to further progress.

All the bores as above, with most of the tubing, have from one cause or another been lost, except the 375-foot bore, which is still capable of being continued by the insertion of a 4½-inch tube.

Our plant consists of the ordinary percussion drill, &c., as used in most of the oil countries of America, which no doubt are worked to advantage in some situations and under some circumstances, but I am strongly of opinion that they are not all that is required in our case, and that we should be in a much better position had we in the first place adopted the diamond drill specially arranged in accordance with the nature of our requirements.

For your further information, I may mention that the Southern Cross Petroleum Company, situate about 40 miles from our works, have also expended a large amount of money with no better results, having lately lost their tools in a 730-feet bore.

Wishing you every success in your highly important undertakings, &c.,—

I remain, &c.,

JOHN ROSSITER,
Mechanical and Mining Engineer.

APPENDIX M.

Port of Hay.

Return showing value of Imports and Exports and Arrivals and Departures of Steamers, with their net tonnage, for the years 1876 to 1883 inclusive.

Year.	Inwards.						Year.	Outwards.					
	South Australian.			Victorian.				South Australian.			Victorian.		
	Value.	Arrivals.	Tonnage.	Value.	Arrivals.	Tonnage.		Value.	Departures.	Tonnage.	Value.	Departures.	Tonnage.
	£			£				£			£		
1876	166	1	140	4,089	6	1,251	1876	.....	.....	.....	.....	.....	...
1877	648	2	134	19,504	57	11,342	1877	.....	2	415	194,992	57	11,342
1878	24	4	331	43,740	80	16,280	1878	.....	.....	.....	374,123	80	16,280
1879	...	.....	.....	10,032	54	13,121	1879	.....	.....	.....	788,472	60	14,264
1880	...	.....	.....	13,221	79	21,594	1880	.....	.....	.....	946,846	84	21,594
1881	...	3	606	4,356	82	19,912	1881	.....	3	704	572,504	83	19,943
1882	80	10	1,320	32,762	73	13,204	1882	.....	4	590	489,081	79	12,418
1883	...	5	397	13,395	40	8,378	1883	.....	5	418	293,689	43	8,838

APPENDIX N 1.

Statement of Quantity of Water pumped at the Hay Municipal Waterworks for year ending June 30, 1883.

	No. of hours pumps were at work.	No. of gallons pumped.		No. of hours pumps were at work.	No. of gallons pumped.
1882—			1883—		
July	105	737,835	January	258	1,812,966
August	82	576,214	February	199	1,398,373
September	135	948,645	March	211	1,482,697
October	201	1,412,427	April	163	1,145,401
November	262	1,841,074	May	128	899,456
December	234	1,644,318	June	93	583,441
				2,071	14,480,847

Total for 1881 ..... 14,070,975 galls.
„ 1882 ..... 16,956,633 „

APPENDIX N 2.

APPENDIX N 2.

RECORD of height of Murrumbidgee River.

Year.	Month.	Above summer level.	Summer level.	Below summer level.	Remarks.
1879	1 October	23 ft. 8 ins.			9½ inches short of level of flood, 1870.
"	8 "	21 ft.			
"	15 "	21 ft. 1 in.			Falling slowly.
"	22 "	17 ft.			
"	29 "	17 ft.			
"	5 November	22 ft.			
"	12 "	21 ft.			
"	19 "	13 ft. 6 ins.			
"	26 "	12 ft.			
"	3 December	13 ft.			
"	12 "	11 ft.			
"	20 "	7 ft.			
"	31 "	5 ft.			
1880	7 January	4 ft.			
"	14 "	4 ft.			
"	21 "	4 ft.			
"	February ... March ...				No records of below summer level.
"	21 April	5 ft. 6 ins.			
"	28 "	4 ft.			
"	8 May	10 ft.			
"	12 "	9 ft.			
"	15 "	12 ft.			
"	19 "	10 ft.			
"	22 "	7 ft.			
"	2 June	8 ft.			
"	9 "	9 ft.			
"	16 "	8 ft.			
"	23 "	6 ft.			
"	30 "	7 ft.			
"	7 July	10 ft.			
"	10 "	12 ft.			
"	17 "	10 ft.			
"	21 "	9 ft. 6 ins.			
"	28 "	9 ft.			
"	4 August	12 ft.			
"	10 "	10 ft.			
"	18 "	13 ft. 6 ins.			
"	21 "	15 ft. 6 ins.			
"	28 "	15 ft.			
"	4 September	13 ft.			
"	11 "	14 ft.			
"	18 "	12 ft.			
"	25 "	13 ft.			
"	6 October	11 ft.			
"	16 "	9 ft. 6 ins.			
"	20 "	9 ft. 4 ins.			
"	23 "	4 ft. 3 ins.			
"	27 "	6 ft. 6 ins.			
"	3 November	10 ft.			
"	6 "	11 ft. 6 ins.			
"	10 "	9 ft.			
"	20 "	7 ft.			
"	24 "	10 ft.			
"	27 "	8 ft.			
"	1 December	6 ft.			
"	8 "	7 ft.			
"	15 "	5 ft.			
"	22 "	4 ft.			
1881	1 January	2 ft.			
"	8 "	2 ft.			Stationary.
"	12 "		Summer level		
"	19 " 1 February ...			Below summer level	
"	2 "		Summer level		
"	16 "	2 ft.			Rising.
"	19 "	4 ft.			Falling.
"	2 March	1 ft.			
"	9 "		Summer level		
"	9 April		Summer level		
"	13 "	4 ft.			
"	16 "	3 ft.			
"	20 "	2 ft.			
"	27 "	9 ins.			
"	4 May		Summer level		
"	11 "		Summer level		
"	14 "	7 ft. 8 ins.			
"	18 "	1 ft.			
"	21 "	7 ft.			
"	25 "	4 ft.			
"	1 June	3 ft.			
"	11 "	4 ft.			
"	15 "	5 ft.			
"	18 "	6 ft. 6 ins.			
"	22 "	5 ft.			
"	29 "	7 ft. 6 ins.			
"	2 July	6 ft.			

Year.	Month.	Above Summer level.	Summer level.	Below Summer level.	Remarks.
1881	6 July	6 ft. 8 ins.			
,,	9 ,,	5 ft.			
,,	13 ,,	4 ft.			
,,	20 ,,	4 ft.			
,,	23 ,,	3 ft.			
,,	30 ,,	3 ft. 6 ins.			
,,	3 August	2 ft. 6 ins.			
,,	10 ,,	2 ft.			
,,	17 ,,	3 ft.			
,,	20 ,,	3 ft. 2 ins.			
,,	27 ,,	3 ft. 9 ins.			
,,	31 ,,	6 ft.			
,,	10 September	5 ft.			
,,	17 ,,	5 ft. 6 ins.			
,,	24 ,,	6 ft.			
,,	28 ,,	7 ft. 6 ins.			
,,	5 October	5 ft. 6 ins.			
,,	12 ,,	4 ft. 6 ins.			
,,	19 ,,	4 ft.			
,,	22 ,,	5 ft. 4 ins.			
,,	29 ,,	7 ft. 6 ins.			
,,	2 November	9 ft. 3 ins.			
,,	5 ,,	8 ft.			
,,	9 ,,	6 ft.			
,,	16 ,,	5 ft.			
,,	23 ,,	3 ft. 4 ins.			
,,	30 ,,	4 ft.			
,,	3 December	5 ft. 4 ins.			
,,	10 ,,	5 ft. 6 ins.			
,,	17 ,,	3 ft. 6 ins.			
,,	21 ,,	3 ft.			
,,	24 ,,	3 ft.			
1882	7 January	10 ins.			
,,	11 ,,			Very low	
,,	14 ,,	1 ft.			
,,	18 ,,			Falling	
,,	21 ,,			Low	
,,	1 February			Falling	
,,	4 ,,		Summer level		Lower than ever known.
,,	8 ,,				Still falling.
,,	18 ,,			18 inches	Falling.
,,	25 ,,			12 inches	Rising.
,,	11 March				Several inches lower than for years.
,,	22 ,,	2 ft.			
,,	29 ,,		Summer level		Falling.
,,	1 April			Below summer level	
,,	8 ,,			8 inches	Falling.
,,	12 ,,			12 inches	
,,	15 ,,			12 inches	
,,	22 ,,	2 ft.			
,,	3 May	6 ins.			
,,	10 ,,		Summer level		
,,	17 ,,		Summer level		
,,	24 ,,	6 ins.			
,,	31 ,,	18 ins.			
,,	3 June	3 ft.			
,,	14 ,,	3 ft.			
,,	21 ,,	2 ft. 6 ins.			
,,	28 ,,	6 ft.			
,,	12 July	2 ft.			
,,	19 ,,	4 ft. 8 ins.			
,,	26 ,,	8 ft. 4 ins.			
,,	29 ,,	6 ft.			
,,	2 August	4 ft. 6 ins.			
,,	9 ,,	5 ft. 6 ins.			
,,	16 ,,	6 ft. 4 ins.			
,,	23 ,,	8 ft.			
,,	30 ,,	6 ft. 6 ins.			
,,	6 September	10 ft.			
,,	13 ,,	13 ft.			
,,	20 ,,	17 ft.			
,,	27 ,,	9 ft.			
,,	4 October	8 ft.			
,,	14 ,,	8 ft.			
,,	21 ,,	9 ft.			
,,	28 ,,	8 ft.			
,,	1 November	5 ft. 6 ins.			
,,	4 ,,	7 ft.			
,,	11 ,,	6 ft.			
,,	4 December	4 ft. 2 ins.			
,,	9 ,,	7 ft.			
,,	13 ,,	9 ft.			
,,	23 ,,	10 ft. 4 ins.			
,,	30 ,,	5 ft. 6 ins.			
1883	20 January	1 ft. 8 ins.			
,,	24 ,,	1 ft. 3 ins.			
,,	27 ,,		Summer level		
,,	3 February		Summer level		
,,	20 ,,		Summer level		
,,	24 ,,	1 ft. 8 ins.			
,,	3 March	1 ft.			

Year.	Month.	Above Summer level.	Summer level.	Below Summer level.	Remarks
1883	10 March		Summer level		
"	31 "		Summer level		
"	7 April		Summer level		
"	21 "		Summer level		
"	26 "	6 ins.			
"	2 May		Summer level.		
"	19 "	1 ft. 8 ins.			
"	26 "	2 ft.			
"	6 June	2 ft.			
"	13 "	2 ft. 8 ins.			
"	20 "	3 ft.			
"	30 "	2 ft.			
"	4 July	5 ft. 8 ins.			
"	7 "	7 ft. 2 ins.			
"	14 "	8 ft.			
"	21 "	7 ft.			
"	28 "	5 ft. 8 ins.			
"	1 August	5 ft.			
"	8 "	3 ft. 6 ins.			
"	18 "	4 ft. 6 ins.			
"	22 "	7 ft. 8 ins.			
"	25 "	10 ft.			
"	29 "	11 ft.			
"	1 September	9 ft.			
"	12 "	5 ft. 6 ins.			
"	16 "	8 ft. 6 ins.			
"	26 "	10 ft.			
"	3 October	8 ft. 6 ins.			
"	10 "	6 ft. 8 ins			
"	17 "	9 ft. 9 ins.			
"	31 "	9 ft. 6 ins.			
"	7 November	9 ft. 4 ins.			
"	14 "	9 ft.			
"	21 "	7 ft.			
"	1 December	8 ft. 4 ins.			
"	8 "	5 ft. 4 ins.			
"	12 "	5 ft.			
"	19 "	3 ft. 6 ins.			
"	22 "	3 ft.			
"	26 "	3 ft.			
"	29 "	1 ft. 6 ins.			
1884	2 January	1 ft. 6 ins.			
"	9 "	9 ins.			
"	16 "	6 ins.			
"	19 "		Summer level.		
"	30 "		Summer level.		
"	2 February	6 ins.			
"	6 "	3 ins.			
"	16 "			Below summer level	
"	8 March			1 ft. 9 ins.	
"	22 "			Below summer level	Stationary.
"	26 "			2 ft.	
"	2 April			1 ft.	Rising.
"	9 "			20 inches	
"	16 "			2 ft.	
"	23 "			2 ft.	
"	30 "			1 ft.	Rising.
"	7 May			10 ins.	
"	14 "	12 ins.			
"	21 "			Below summer level	
"	24 "	1 ft.			
"	4 June	1 ft. 4 ins.			
"	11 "			1 ft. 4 ins.	Falling.
"	18 "	1 ft. 3 ins.			
"	25 "	1 ft. 5 ins.			
"	2 July	3 ft. 6 ins.			
"	9 "	5 ft.			
"	16 "	3 ft. 6 ins.			
"	23 "	4 ft. 8 ins.			
"	30 "	3 ft. 2 ins.			
"	2 August	2 ft. 8 ins.			
"	9 "	1 ft. 6 ins.			
"	16 "	1 ft.			
"	23 "	2 ft. 8 ins.			
"	30 "	3 ft. 8 ins.			
"	6 September	3 ft.			
"	13 "	4 ft. 6 ins.			
"	20 "	8 ft. 9 ins.			
"	24 "	9 ft. 7 ins.			
"	27 "	8 ft.			
"	1 October	6 ft. 4 ins.			
"	8 "	5 ft. 6 ins.			
"	15 "	4 ft. 6 ins.			
"	25 "	5 ft. 6 ins.			
"	1 November	4 ft. 6 ins.			
"	8 "	5 ft.			
"	12 "	6 ft.			
"	15 "	5 ft. 6 ins.			
"	22 "	5 ft.			
"	26 "	3 ft. 6 ins.			

APPENDIX O 1.

The Superintendent of Drills to The Under Secretary for Mines.

Sir, Department of Mines, Diamond Drill Branch, Sydney, 25 October, 1884.

In submitting, for the information of the Honorable the Minister, the enclosed returns relative to the diamond drills and other boring machines employed in the Colonies of Victoria, South Australia, Tasmania, and New Zealand, as supplied by the respective Governments of these Colonies, I have the honor to annex a comparative statement of the working of diamond drills in the adjacent Colonies of Victoria and South Australia (as taken from returns), and of the working of the diamond drills in this Colony.

The returns furnished by the other Colonies are so incomplete that no comparison could be made. With respect to the boring machines (other than diamond drills), the information supplied is of such a nature that it is impossible to make a comparison between any of the Colonies, with the exception of the working cost per foot, which in South Australia amounted to £3 1s. 6d.,* whilst in this Colony it was only 19s. 8d. per foot for the work done during the year 1883.

I desire particularly to invite the attention of the Honorable the Minister to the tabulated statement herewith annexed, which has been prepared from the information supplied by the Government of South Australia, showing the amount of work done and the cost thereof of boring machines in that Colony.

I have, &c.,
W. B. HENDERSON,
Superintendent of Drills.

* Note (*on revision*):—I find this sum should be £3 8s. 8d.—W.B.H., 20/6/85.

COMPARATIVE Statement relative to Diamond Drills in the Colonies of Victoria, South Australia, and New South Wales.

Colony.	No. of machines.	Cost of same.	Cost of working.	Total.	No. of feet bored.	Rate per foot.
		£ s. d.	£ s. d.	£ s. d.	feet	s. d.
Victoria	15	18,000 0 0	11,200 0 0	29,200 0 0	17,136	0 13 0¾
South Australia	2	18,138 6 8	6,006 14 10	24,145 1 6	1,373½	4 7 5
New South Wales	7	11,328 12 8	3,404 17 4	14,733 10 0	6,643′ 7¾″	0 10 3

W. B. HENDERSON,
Superintendent of Drills.

TABULATED Statement showing qualities and proportions of fresh water struck in New South Wales, Victoria, and South Australia.

Colony.	No. of bores put down.	Average depth.	Fresh water tapped.	Salt water tapped.	Brackish water tapped.	No water tapped.	No quality stated.	Percentage of fresh water tapped to No. of bores put down.
		ft. in.						
New South Wales	42	144 $3_{\frac{27}{128}}$	29	7	4	2	.....	70
Victoria	330	73 $11\frac{71}{88}$	56	Salt or brackish—167		106	.....	16¾
South Australia	21	297 $4\frac{4}{21}$	6	8	3	2	2	28½

STATEMENT showing the cost price, working cost, time occupied, depth bored, and cost per foot of the Boring-machines employed by the Government of South Australia in search of water; taken from a Return, printed October 18th, 1883.

Description of machine.	Cost of each set of machinery.	Total cost of machinery.	Working cost, exclusive of machinery and transport.	Total working cost, exclusive of machinery and transport.	Depth bored.	Total depth bored.	Time occupied.	Total time occupied.	Average depth bored per day.	Cost per foot (working).
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	ft. in.	ft. in.	days hrs.	days hrs.	ft. in.	£ s. d.
Diamond Drill....	8,138 6 8		3,581 14 10		321 0		443 10			
Do	10,000 0 0		225 0 0		406 0		70 0			
Do			2,200 0 0		646 6		260 20			
		18,138 6 8		6,006 14 10		1,373 6		774 6	1 9⅓	4 7 5⅝
Boring machine ..	365 0 0		530 17 2		89 0		313 0			
Do	2,022 0 1		1,496 7 0		322 0		273 21			
Do	380 0 0		827 3 6		292 0		313 0			
			184 16 11		165 0		65 5			
Do	1,442 0 0		895 0 0		464 0		652 2			
Do	2,469 16 8		1,734 17 10		765 0		417 8			
		6,678 16 9		5,669 2 5		2,097 0		2,034 12	1 0⅓	2 14 0¾
Hand-tools	750 0 0		3,160 3 4		809 0		940 0			
Do	.....		836 6 11		269 10		313 0			
Do	250 0 0		505 19 10		133 6		.....			
					80 0					
Do	185 0 0		1,670 3 2		240 0		368 4			
		1,185 0 0		6,172 13 3		1,587 4		1,803 18	0 10⅔	4 0 3⅝
Contract, private..	.....			1,276 0 1	365 0	365 0	91 7	91 7	4 0	3 9 11
Contract	.....			442 0 0	221 0		438 10			2 0 0
Do	.....			484 0 0	242 0		166 12		0 9⅝	2 0 0
						463 0		594 22		
		26,002 3 5		20,050 10 7		5,835 10		5,298 17	1 1¼	3 8 8¼

NOTE.—Besides the above, 403 feet 6 inches have been bored, the cost of which is not given.

APPENDIX O 2.

APPENDIX O 2.

Particulars of Boring done by Mr. Bignall, at Warrigul.

At No. 1 bore-shaft sunk to rock, depth 60 feet; bored with drill 150 feet; struck water in fine drift; water rising to within 40 feet of surface; supply equal to 30,000 sheep daily; water lifted by means of windmill and No. 5 Blake's pump, worked by 8-horse power steam-engine.

No. 2 bore-shaft sunk to well, depth 46 feet; bored with drill 171 feet 8 inches; struck water in fine drift; water rises to within 40 feet of surface; supply equal to 25,000 to 30,000 sheep; tested with pump and engine when complete; four days working without lowering water in bore; pump throwing 2,500 gallons per hour.

No. 3 bore put down 218 feet; struck large supply of brackish water; intend tubing and boring to fresh water; have rods and tubes equal to 1,500 feet.

Besides these wells, there are two others sunk by hand labour to a depth of 35 feet and 169 feet respectively, both of which give a good supply of fresh water. It is the intention of the proprietors to put down two more wells, one of which is in course of excavation. These will make the water supply of station equal to all requirements.

APPENDIX O 3.

STATEMENT showing the cost price, working cost, time occupied, depth bored, and cost per foot of the Boring-machines employed by the Government of New South Wales in search of water, to November 1st, 1884.

Description of machine.	Cost of each set of machinery.	Total cost of machinery.	Working cost, exclusive of machinery and transport.	Total working cost, exclusive of machinery and transport.	Depth bored.	Total depth bored.	Time occupied.	Total time occupied.	Average depth bored per day.	Cost per foot (working).
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	ft. in.	ft. in.	days	days	ft. in.	£ s. d.
Diamond Drill ..	1,467 1 10		305 10 1		1,005 2¾		174		5 9¼	0 6 0¼⅜
* do ..	3,121 0 4		347 3 1		744 5½		303		2 5½	0 9 8⅛⅜
		4,588 2 2		652 13 2		1,749 8¼		477		
Water Auger	512 11 8		320 14 9		488 3		292		1 8¾	0 13 1⅜
Do	.....		426 0 8		591 6		362		1 7⁹⁄₁₀	0 14 4⅞
Do 2	1,032 17 1		497 9 3		294 6		209		0 11¼	1 13 9⅜
Do 3	2,241 1 4		1,976 3 10		1,407 11		568		2 6½	1 8 0⅞
Do	557 16 4		207 13 4		485 11		156		3 1⅜	0 6 0⁷⁄₁₆
Do	787 4 9		128 9 6		83 0		73		1 1⅜	1 10 11¼
		6,131 11 2		3,556 11 4		3,351 1		1,430		
		9,719 13 4		4,209 4 6		5,100 9½		2,207	2 3¾	0 16 6⁷⁄₂₀

* Part of the work at this bore was done by prison labour, which is not included here.

NOTE.—Other bores to the depth of 1,128 feet 5 inches, costing the Department 7s. 9½d. per foot, were also put down; but as part of the labour was supplied by those persons engaging the augers, no reliable returns for the whole work can be given.

Department of Mines,
Diamond Drill Branch.

W. B. HENDERSON,
Superintendent of Drills.

APPENDIX O 4.

COMPARATIVE Statement of the cost of and work done by the Australian and Tiffin Water Augers to 31st March, 1884.

Number of machine.	Name of machine.	Cost of machinery, including tools.	Depth of borings.	Expenditure for tools and repairs for this boring.	Average daily borings.
		£ s. d.	ft. in.	£ s. d.	
8	Australian Water Auger	1,277 8 7	1,503 10	206 5 7	In proportion as 1·25 is to 1·00.
6	Tiffin Water Auger	1,661 15 0	1,765 2	1,356 15 6	

WM. B. HENDERSON,
Superintendent of Drills.

Department of Mines, Diamond Drill Branch,
Sydney, 29th September, 1884.

APPENDIX Q 1.

Mr. R. C. Webb to The President.

Dear Sir, Kilfera, Ivanhoe, N.S.W., 22 December, 1884.

When giving evidence before you on the 4th instant, I omitted to mention that the round tanks (sketch enclosed) are my favourite tanks, and much the best for stock.

Contractors have a dislike to tackle them at first, but once they have done one they will do them for the same price as the ordinary square ones.

When these tanks are made where the country is quite flat, I would advise the earth taken out to be put in form of bank all round excavation, but in no case to be nearer to edge of hole than 66 feet. In many cases the earth removed would be used in form of dam.

Yours faithfully,
R. C. WEBB.

APPENDIX Q 2.

THE average depth of the wells to first water is 100 feet. We generally bore another 50 or 100 feet for a supply, but in no case have we got fresh water.

R. C. WEBB.

APPENDIX S.

APPENDIX S.

Mr. William Farrer to The President.

Sir, Thuraby, Newtown, 21 January, 1885.

I would wish to supplement the evidence that I gave before you on Thursday last, January 15th, in regard to matters connected with the Counties of Oxley, Gregory, and Flinders.

1. With regard to the recommendation that I submitted to you, that weirs should be made in the river Macquarie, by means of which water could be thrown at will through sluice-gates into the Beleringa, Gunningba, Duck, Crooked, and Mara Creeks, I wish to point out that my knowledge of the locality leads me to think that one weir in the Macquarie could be made to serve for both the Beleringa and Gunningba Creeks; another for both the Duck and Crooked Creeks; while a third would be required for the Mara Creek alone.

2. With regard to my suggestion that earth-work dams should be made in lieu of bridges over creeks, which so seldom run or contain water in this dry part of the country, I beg to point out that it would be absurd to expect overshot dams made of earth-work alone, and with the earth-work unprotected, to stand. When I recommended such dams to be made with depressions in the middle, I did so with the intention of merely presenting an idea which might be worked into a practical form by an officer who had received the requisite professional training. I purposely avoided offering detail suggestions in regard to the manner of protecting the embankment, and enabling it to serve the purpose of a roadway. I venture to point out that even if an efficient roadway-dam were to cost as much as a bridge, the fact of its providing water for the traffic ought to cause it to be preferred.

I am, &c.,
WILLIAM FARRER.

APPENDIX U 1.

Annual Report, 1884.

Watering-places in charge of Mines Department.

District.	Road.	Locality.	Tank.	Capacity.	Well.	Depth.	Water.	Length Road.	Remarks.
				gallons				Approx.	
Wagga	Wagga to Junee	Wallacetown	Dam	.....	...	.....	.....	20 m.	
,,	Junee to Temora	Junee	,,	.....	...	.....	.....	.. ...	
,,	,,	Hurley's	,,	.....	...	.....	.....	.....	
Deniliquin	Jerilderie to Tocumwall	Berrigan Creek	...	.....	Well	139' 0"	28' 0"	45 m.	
,,	,,	Murray Hut	...	.....	,,	126' 0"	11' 0"	.....	
,,	Hay to Deniliquin	Black Swamp	Tank	3,000,000	..	.....	.....	82 m.	
Hay	,,	16-mile Gums	,,	2,000,000	...	.....	... ..	.. ...	Approx.
,,	Hay to Booligal	Wooloondool or 13-mile.	...	.....	Well	.....	.....	50 m.	
,,	,,	One-tree	Tank	2,000,000	...	.....	.. ...	.....	Approx.
,,	,,	Quandong	,,	2,000,000	...	.....	.....	.....	
,,	Carrathool to Hillston	Old Gunbar	...	.....	Well	94' 0"	27' 0"	70 m.	
Balranald	Balranald to Ivanhoe	Box Creek	Tank	3,000,000	...	.....	.....	145 m.	
,,	,,	Youhl Plain	,,	3,000,000	...	.....	.....	.....	
,,	,,	Til Til	,,	3,000,000	...	.....	... ..	.....	
Booligal	Booligal to Wilcannia	Jumping Sandhill	...	....	Well	130' 0"	20' 0"	195 m.	Approx.
,,	,,	Mossgiel	Tank	4,000,000	..	.....	.....	.....	
,,	,,	Holy Box	...	.....	Well	140' 0"	50' 0"	.....	Approx.
,,	,,	Boonoona	Tank	2,000,000	...	.....	.....	.....	Silted.
,,	,,	12-mile	,,	3,000,000	...	.....	.....	.....	
,,	,,	35-mile	,,	3,000,000	...	.....	.....	.....	
,,	,,	48-mile	,,	3,000,000	...	.....	.....	.....	
Cobar	Cobar to Louth	Cuttygullyaroo	,,	3,000,000	...	.....	.....	90 m.	
,,	Cobar (Township)	Town	,,	1,500,000	...	.....	.....	.... .	Approx.
,,	,,	Stock	,,	2,000,000	...	.....	.....	.....	,,
,,	Cobar to Bourke	Nullamut	,,	2,000,000	...	.....	.....	120 m.	,,
,,	,,	Tindaric	,,	2,000,000	...	.....	.....	.....	,,
,,	,,	Curraweena	,,	2,000,000	...	.....	... ..	.....	,,
,,	,,	Corrilla	,,	2,000,000	...	.....	.....	.....	,,
,,	,,	Two Waterholes	,,	2,000,000	...	.....	.....	.....	,,
,,	Cobar to Nyngan	Booroomugga	,,	2,000,000	...	.....	.....	80 m.	,,
,,	,,	Muriel	,,	2,000,000	...	.....	.....	.....	,,
,,	,,	Hermitage	,,	2,000,000	...	.....	.....	.....	,,
Wilcannia	Wilcannia to Hungerford	Copago	,,	.....	..	.....	.....	.....	
,,	,,	Momba Waterhole	...	.....	...	.....	.....	.....	
,,	,,	Peri Springs	Tank	2,000,000	...	.....	.....	.....	Approx.
,,	,,	Nipper's Creek	,,	2,000,000	...	.....	.....	.....	,,
,,	,,	Warramurtie	,,	2,000,000	...	.... .	.. ...	.....	,,
,,	,,	Goomboolara	,,	2,000,000	...	.....	.....	.....	,,
Bourke	Bourke to Wanaaring	Goonery Artesian and new bores.	..	....	Well	.....	.....	112 m.	
,,	Bourke to Hungerford	Ford's Bridge	Tank	2,000,000	...	.. ...	.....	130 m.	,,
,,	,,	Coonbilly	Spring	.....	...	.....	.....	.....	Unimproved
,,	,,	Youngarrina	,,	.....	...	.....	.....	.....	,,
,,	,,	Mother Nosey	,,	.....	...	.....	.....	... ..	,,
,,	,,	Yantabulla	,,	.....	...	.....	.....	.....	,,
,,	,,	Whip	,,	.....	...	.....	.....	.....	,,
,,	,,	Warroo	,,	.....	...	.....	.....	.....	,,
,,	Bourke to Eungonia	Leila	,,	.....	...	... ..	.....	70 m.	
Walgett	Walgett to Bangate	Boro	Tank	3,000,000	...	.....	.....	75 m.	Approx.
,,	,,	Lightning Ridge	,,	3,000,000	...	.....	.....	.....	
,,	Walgett to Wilby Wilby	Bunghill	,,	3,000,000	...	.....	.... .	60 m.	
,,	,,	Cumborah	Spring	.....	...	.....	.....	.....	
,,	Collarindibri, Angledool	New Bores	...	... .	...	.....	.....	60 m.	
Coonabarrabran	Baradine to Coonabarrabran	Yarraman	Spring	.....	...	.....	.....	30 m.	
Liverpool Plains	Boggabri to Coolah	Tambar	,,	.....	..	.....	.....	.....	
Narrabri	Narrabri to Moree	Galathera	Tank	.....	...	.....	.....	60 m.	
,,	,,	Boggy Creek	,,	.....	...	.....	.....	.....	
Orange	Orange to Canowindra	Cargo	,,	.....	...	.....	.....	.....	
Forbes	Parkes (Township)	Bushman's	Dam	.....	...	.....	.....	.....	

Tanks	35
Wells	7
Dams	4
Springs	10
Waterhole	1
Total	57

APPENDIX U 2.

APPENDIX U 2.

WATERING-PLACES notified by the Department of Public Works as ready for immediate transfer.

District.	Road.	Locality.	Tank.	Capacity.	Well.	Depth.	Water.	Length Road.	Remarks.
				gallons				approx.	
Hillston	Hillston, Cobar	North Roto	...	...	Well	167′ 0″	6′ 0″	220 m.	
,,	,,	Merimeriwa	Tank	3,000,000	...	...	...	...	
,,	,,	Wagga	,,	3,000,000	...	...	...	...	
Cobar	,,	Rock Holes	,,	3,000,000	...	...	...	...	
,,	,,	Sandy Creek	,,	3,000,000	...	...	...	...	
,,	,,	Priory	,,	3,000,000	...	...	...	...	
,,	,,	Shearley's	,,	5,000,000	...	...	...	...	
,,	,,	Gibbs	,,	3,000,000	...	...	...	...	
,,	Cobar, Louth	Booroondarra	,,	3,000,000	...	...	...	90 m.	
,,	,,	Kerrigundi	,,	5,000,000	...	...	...	...	
,,	Cobar, Wilcannia	Amphitheatre or Leslie's.	,,	...	...	...	...	140 m.	
Condobolin	Condobolin to Cobar	Mowabla	,,	3,000,000	...	...	...	130 m.	
,,	,,	Boona	,,	3,000,000	...	...	...	...	
,,	,,	Tinda	,,	3,000,000	...	...	...	...	
,,	,,	Mombill	,,	3,000,000	...	...	...	...	
,,	,,	Beloura	,,	3,000,000	...	...	...	...	
,,	,,	Nymagee	,,	4,000,000	...	...	...	...	
Bourke	Bourke to Eungonia	The Lake	,,	4,500,000	...	...	...	70 m.	
,,	,,	Clay-pan Hollow	,,	3,000,000	...	...	...	...	
,,	Eungonia, Culgoa	Ledknappa	,,	3,000,000	...	...	...	...	
Coonabarrabran.	Gunnedah to Coonabarrabran.	Mannum	...	...	Well	76′ 6″	44′ 0″	62 m.	
,,	Coonabarrabran, Pilliga	Baradine	...	...	Well	122′ 0″	40′ 01″	60 m.	
Albury	Howlong to Walla Walla	Jindera	Tank	3,000,000	...	...	...	24 m.	
,,	Albury to Doodle Cooma	Walla Walla	,,	3,000,000	...	...	...	35 m.	
,,	Mount Hope	Mount Hope	,,	3,000,000	...	...	...	...	
	Works at which repairs and alterations have been completed.								
Narrabri	Narrabri to Moree	Galathera	Tank	...	...	...	...	...	
,,	,,	Boggy Creek	,,	...	...	...	...	...	
Cobar	Nyngan to Cobar	Hermitage	,,	...	...	...	...	...	

New works ... 25
Old ,, ... 3
28

APPENDIX U 3.

WATERING-PLACES in course of construction.

District.	Road.	Locality.	Tank.	Capacity.	Well.	Depth.	Water.	Remarks.
				gallons.		feet.	feet.	
Albury	...	Carson's Swamp	Tank	1,500,000	...	...	...	In progress.
	Urana to Corowa	Lowesdale	,,	3,000,000	...	...	...	,,
	,, ,,	Daysdale	,,	3,000,000	...	...	...	,,
Deniliquin	Hay to Deniliquin	Booroorban, or Pine Ridge.	,,	3,000,000	...	...	...	Completed.
Hay	Booligal, Wilcannia	Tom's Lake	,,	5,000,000	...	...	...	,,
	,, ,,	Polygonum Hut	...	...	Well	130	29	Nearly completed.
	,, ,,	Ward's	Tank	...	...	...	...	In progress.
	,, ,,	26-mile	,,	4,000,000	...	...	...	Excavation completed.
	Carrathool, Hillston	Dry Lake	...	...	Well	107	22	Nearly complete.
	,, ,,	Crow's Nest	...	...	,,	120	6	,,
Balranald	Balranald to Ivanhoe	Dolmoreve	...	...	,,	...	...	In progress.
	,, ,,	Clare	Tank	...	...	...	...	,,
	,, ,,	35-mile	,,	...	...	...	...	,,
	,, ,,	Willandra	...	...	Well	...	...	,,
Hillston	Hillston to Cobar	Roto	...	...	,,	136	18	Nearly completed.
Condobolin	Condobolin to Cobar	Wicklow	Tank	3,000,000	...	...	...	,,
	,, ,,	Keighran's	,,	3,000,000	...	...	...	In progress.
Cobar	Nymagee to Nyngan	Balinda	,,	3,000,000	...	...	...	,,
	,, ,,	29-mile	,,	3,000,000	...	...	...	,,
	,, ,,	50-mile	,,	3,000,000	...	...	...	,,
	Cobar to Bourke	Hellman's	,,	3,000,000	...	...	...	Nearly completed.
Wilcannia	Wilcannia to Tippooburra.	Mulga Valley	...	...	Well.			
	,, ,,	Dry Lake	Tank	2,000,000	...			
	,, ,,	Beefwood	...	...	Well.			
	,, ,,	Mena Murtie	...	...	,,			
	,, ,,	Tarella	Tank	3,000,000	...			
	,, ,,	The Peak	,,	3,000,000	...			Not completed—delayed by seasons.
	,, ,,	J K Waterhole	...	...	Well.	...	...	
	,, ,,	Murlippa	Tank	3,000,000	...			
	,, ,,	Cobham	,,	3,000,000	...			
	,, ,,	Coally	,,	3,000,000	...			
	,, ,,	Milparinka	,,	6,000,000	...			
	,, ,,	Waratta	,,	3,000,000	...			
	Wilcannia, Hungerford	12-mile	,,	2,000,000	...			
Walgett	Walgett, Goodooga	Narran	,,	3,000,000	...	...	...	In progress.
Coonabarrabran.	Gunnedah to Coonabarrabran.	Baloolah	...	...	Well.	...	...	Not completed.
		Normanston	...	...	,,	...	...	,,
Dubbo	Girilambone (township)	Girilambone	Tank	4,000,000	...	...	...	Completed.

Wells ... 12
Tanks ... 26
New works in progress ... 38

APPENDIX U 4.

WATERING-PLACES recommended for construction, but not yet undertaken. This includes those recommended for the current year.

District.	Road.	Locality.	Tank.	Capacity.	Well.	Depth.	Water.
Forbes	Forbes to Grenfell	Half-way	Tank				
	Parkes to Bogan Gates	12 miles out	,,				
Dubbo	Dubbo, Parkes	Tomingley	,,				
Narrandera	Whitton, Eunbalong	8 miles	,,				
	,, ,,	Near Mount Elliott	,,				
	,, ,,	Pulltop Creek	Weir				
	,, ,,	Rankin's Spring			Well		
	,, ,,	Naradin			,,		
	,, ,,	Yarran w.h.	Tank				
Hay	Hay, Gunbar	24-miles			Well		
Booligal	Mossgiel, Paddington	Couroura Swamp	Tank				
Narrabri	Narrabri to Moree	Little Bungle	,,				
Warialda	Warialda, Inverell	(1)			Well		
Liverpool Plains	Breeza to Coolah	(4)			,,		
	,, ,,				,,		
	,, ,,				,,		
	,, ,,				,,		
Cobar	Cobar, Wilcannia	(5)	Tank				
	,, ,,		,,				
	,, ,,		,,				
	,, ,,		,,				
	,, ,,		,,				
	Coolaman	(1)	,,				
Bourke	Byerock, Brewarrina	(2)	,,				
	,, ,,		,,				
		25 works.					

APPENDIX V.

WATER Supply by Artesian Wells for the Borough of Tamworth.

THERE can be no doubt but that the question of water supply and conservation is, at the present time, of vital importance to Australia, and of special local interest. An abundant and economic supply of good pure water for inland towns like Tamworth is very desirable, and must largely conduce to the health, comfort, and welfare of the inhabitants. How to secure this great desideratum is a problem that has puzzled the minds of thoughtful and scientific men for many years, and it is only during the last decade that valuable and practical efforts have been made in this country to solve the difficulty. It has been suggested that in all probability an artesian supply could be obtained for Tamworth if proper steps were taken, and that, instead of the borough having to depend for a very limited and partial supply by the present mode of pumping, that the requirements of the whole town could be properly and efficiently provided for, and ample quantity be also available for purposes of irrigation by gravitation, thus saving the enormous and constant expense of pumping, with a possibility of a break-down at any moment. A few weeks since, Mr. Henderson, the Government Superintendent of Drills, after a very short and cursory examination of the country outside of our town boundary, and in the vicinity of Calrossy, reported officially that there was not much probability of water being obtained in that part of the borough except at a very great depth, say one or two thousand feet, and that the town was not badly in want of a better supply than it at present possessed.

As regards this statement, and his conclusions, I beg to differ with him, and believe I can prove he is entirely mistaken, both as regards the depth at which a supply of good water can be obtained and also the necessity for a better supply.

Mr. Henderson, in his first annual report to the Minister for Mines, says there cannot exist a doubt in the minds of any person who has sufficient time to study this very important matter, that water exists underground in the interior in immense quantities, and over large areas. "I believe," he goes on to say, "not only in the existence of large underground supplies held in the horizontal gravel beds of the inland portion of this Colony, but that water exists in the primitive rocks on the tops of which the alluvial formation now lies. I have found at points along the caps of ranges, the slopes of which are within a stone's throw of each other, that it was impossible to sink a shaft in the rocks on the surface beyond 8 or 10 feet deep by means of ordinary labour, because of the water coming in so freely. In numerous instances in the underground workings of mines in Australia, springs can be seen issuing from the stratified rock within a few yards' distance of each other. I am of opinion that there are internal forces other than capillary or gravitation to account for such flow of water from rocks forming the crust of the earth; and, if I am correct in that opinion, there is no reason to suppose that the primitive rocks of the interior, overlaid and covered from the human eye as they are by the alluvial formations, should be less subject to internal forces or supply of water than those rocks of similar character along our main ranges."

This expression of opinion, coming from such an authority, and no doubt formed after long and careful observation, must be very satisfactory to those who believe that an artesian supply can be obtained for Tamworth, and yet, in the face of what Mr. Henderson has deliberately recorded, for some reason or other, certainly not based on the geological formation of the country he examined, he asserts that there are almost insuperable difficulties in the way of our getting an artesian or flowing supply of water. No doubt it depends on the bore, geologically, and to obtain this the water must be stored in the earth, and have communication with an under stream or water-bearing strata, leading from hills situated higher than the ground surface at the bore. The hill source may be a great distance away; still, if the water-bearing strata are overlain with measures of impervious clay, upon these measures being pierced the water will rise to the surface, unless it finds an escape through upper pervious measures. In the upper beds water is frequently met with in moderate quantities but indifferent in quality, and, as it does not rise to the surface, it has to be pumped up. It has been found in bores, otherwise successful, that it does not rise to the surface until the bore is cased; and the assumption is that when the water gets to the level of the the upper drifts it disperses amongst them, but when it is confined to the tube it rises to the surface. There is always a large proportion of underground water which finds a circuitous route for itself by crevices and joints, and, after coursing for, it may be, many miles underground, such water eventually emerges as springs, which contain in solution the various ingredients which the water has chemically extracted from the rocks.

Johnston, in his "Chemistry of Common Life," says:—"It by no means follows in all cases, perhaps not even in the majority, that the purest water is the best for the health of a given family or for the population of a given district. The bright, sparkling, hard waters which gush out in frequent springs from our chalk and other limestone rocks are relished, not merely because they are grateful to the eye, but because there is something exhilarating in the excess of carbonic acid they contain, and give off as they pass through the warm mouth and throat, and, perhaps, because the lime they hold in solution neutralizes acid matters from the stomach, and acts as a grateful medicine to the system. To abandon the use of such a water, and to drink daily in its stead one entirely free from mineral matter and dissolved oxygen and carbonic acid gas, so far from improving, may injure the individual or local health. This authority clearly shows that spring water of the quality and quantity which we can obtain in the mountains at the back of the town is worth having, and would be immensely valuable, not only for ordinary use, but also for purposes of irrigation; and there can be little doubt, judging by results obtained by

by Mr. Patterson, of Calrossy, in sinking a well upon his land on the slope of the hills, that immense underground supplies of water do exist, and that the water is of excellent quality (as any one that chooses may ascertain for themselves), and have not the slighest doubt in my own mind, that if the work was carried out in a proper manner, that is to say a sufficient depth was sunk, and the bore lined with tubing or casing, that a splendid artesian supply would be obtained Mr. Patterson has successfully secured an ample supply for his own purpose, and incontestably demonstrated, not theoretically, but in a practical manner, that Mr. Henderson was wrong in the conclusions he arrived at; and if the townspeople value an ample supply of good water for all parts of the borough, at a small cost, they should at once take immediate action to have a well sunk higher up than where Mr. Patterson has obtained such a fine supply, either by means of a water auger or a diamond drill.

The geological formation in the locality I have indicated is of a very disturbed character, and belongs to the Devonian period, being chiefly indurated slate, and, in some parts, marked by an intrusion of granite. Mr. Patterson, in sinking the well, went through strata of the following nature:—The first 28 feet consisted of clay, gravel, and boulders, and at this depth a small supply of brackish water was obtained; then a rim of cement was placed round this part for the purpose of keeping it back, and a further depth of 32 feet was sunk through clay, and then rock was found of a bluish slaty nature; this changed to a blue rock of a harder character, and, at a depth of 83 feet, a layer of clay, fine gravel, and sand was got 3 inches thick, and immediately afterwards rock was impregnated with quartz 18 inches thick, dipping north-west; the rock again slightly changed, and after sinking 8 feet more, a drill hole was made 2 feet deep, and the water, in a very short time, rose 35 feet, and continues to give a very large supply, as the windmill pump, which is fixed over the well, fails to exhaust or make much appreciable difference in the depth of water in the well.

In all probability this water has its source at a very much higher level than Tamworth, probably in the New England district; and, as Armidale is 2,066 feet higher than Tamworth, if this conjecture should prove correct the weight and quantity of water must be something enormous, and the artesian supply would, consequently, be of a very satisfactory nature. It is unnecessary to dilate upon the great advantages that would be realized by having water supply in the manner I have indicated. The town is rapidly extending to the foot of the mountains, and something must be done immediately to give that portion of it pure and wholesome water at a cheap rate, and with no niggard hand. The soil on and around the mountains is surprisingly rich and fertile, and many industries connected with fruits and wines could be profitably carried on if water could be obtained abundantly and cheaply for irrigating purposes. Not alone could the household requirements be supplied but manufactories also, and a large population would be induced to occupy the lands right up to the mountain tops.

The land in Australia has great powers of absorption, and if, by means of artesian wells and other methods, we can compel Nature to give up freely some of the water that is contained in her great reservoirs, subterraneous caverns and immense underground rivers, the whole face of the country will be materially changed. We can then almost defy the dreadful monster drought, and the hills and valleys would become the abode of prosperous tillers of the soil, and those who follow in their wake; and, instead of this glorious land of sunshine, endowed by Nature with untold wealth and magnificent beauty, having at times to robe herself in sombre hues, a splendid mantle of beautiful verdure would cover her great plains and fertile slopes right up to the mountain tops, and proclaim in unmistakable terms the victory of mind over matter, and another triumph for the scientific and engineering genius of the nineteenth century.

APPENDIX W.

Mr. F. Y. Wolseley to The Secretary.

My dear Sir, Euroka, 17 July, 1885.

The earth excavator which you saw here I patented some time since; but, as I have not had the leisure to attend to the matter, I have had no public trial of it as yet, waiting till I could get one manufactured with improvements, which practical experience of its working proved to me to be necessary. I have now in course of construction a machine which I think will prove very effective. I purpose exhibiting it at the Great National Show of Victoria, to be held next month at Melbourne.

I will describe the general principles of my patent and its mode of working, and generally give you all the information I can.

The Australian Excavator and Earth Scoop is made almost entirely of steel, except such parts where iron is indispensable, thus rendering the machine lighter and more durable than if made exclusively of iron.

Framework of the machine made of angle steel; to the fore-carriage is attached a wrought steel frame, carrying three ploughs or scarifiers, each having double wings working in hinge points trailing behind; thus, at whatever angle the scarifiers may be inclined, the wings always cut behind in a horizontal line. By means of a screw the ploughs can be regulated to cut to any required depth (in practice I have found 3 in. ample). Behind the ploughs, and revolving in direction opposite to their progress, is a large wheel, 9 ft. in height and 2 ft. wide, resembling a water-wheel. The rim to a depth of 9 in. is divided into sections, forming ten buckets for the reception of the ploughed earth; the buckets have their lips protruding beyond the line of circumference of the wheel, thus more effectively scooping in the earth. The depth of cut or scooping capacity of this wheel is also regulated by a screw, and it can be raised from or lowered into the ground rapidly by the man sitting in front. For convenience of travelling he can raise the wheel 1 foot above the ground, as also the ploughs. The bottom of each bucket works on a hinge, and has a trigger attached to it. As the machine is being moved on, each bucket fills with the broken-up earth, and when each bucket so filled arrives at the proper discharging point the trigger strikes against a loose flat tire wheel, which causes the bottom to lift and to thoroughly eject the earth into a shoot attached to the hind part of the main frame. This shoot conveys the earth into a dobbin hooked on to the machine. The capacity of each bucket is nine shovelfuls of earth; thus at each revolution of the wheel there are ninety shovelfuls of earth scooped up and ejected (in practice I would set the figures down at eighty). The scooping-wheel is regulated to travel with intermittent action, thus enabling it more effectually to scoop up the ploughed earth. It travels slower than the machine; thus its revolutions per minute will depend on the speed at which the machine is being drawn along. Roughly, I estimate its general speed, if the machine is worked with oxen, at some seven revolutions per minute, or some 550 shovelfuls of earth per minute. When trying the machine last, with a team of fresh horses, it ploughed, scooped and delivered 840 shovelfuls of earth, making over nine revolutions per minute with each bucketful.

For making drains a side-delivery shoot is attached to the hind part of the machine, and dobbin, of course, detached. As I consider 9 in. ample depth for all drains for the conveyance of water into tanks, width, not depth, is to be considered, for water confined soon cuts and undermines narrow channels, and the less the surface soil is disturbed the better. Thus I regulate the cut for drains at from 8 in. to 9 in. deep, and 4 ft. to 6 ft. wide at the top to 3 ft. to 5 ft. at the bottom. As it is advisable to deliver all the earth to one side of the drain, the shoot can be altered—shifted from side to side at pleasure—thus allowing the machine to travel to and fro over a long or short drain.

When the drain has been cut to the desired depth and width, then, a side-cutter and mould-iron being attached to each side of the front carriage, the slopes to the drain are made. The cutter cuts the earth at any desired angle, and the mould-iron casts it into the drain, to be received and scooped up by the revolving bucket-wheel.

The dobbins will also be made of steel, and will contain about three-quarters of a yard of earth each. They deliver at the bottom, and will thus evenly distribute the earth as it is paid out; whilst in motion each dobbin is attached by ring-chain to a hook fixed at the hind part of the machine. As soon as one dobbin is full, the man sitting in front liberates a handle or lever, and the dobbin is free. The full dobbin is drawn away by horse and an empty one attached, the machine stopping during the few seconds' detention, and then on till that dobbin is full, to be replaced by an empty one. The machine will keep four dobbins in full work, if the distance be not great at which it is decided to deliver the earth; then, of course, the number of dobbins required will depend on circumstances.

To work the machine with oxen or horses requires the attendance of one man to drive the cattle, one man to sit and regulate the working of the machine, and three or four (as many as may be required) boys to drive the horses when emptying the dobbins. In round numbers, I put the working expenses at from 20s. to 30s. per day, and estimate the cost of excavation of earth at less than one penny per yard. This estimate takes not into consideration the first cost of the plant. I cannot rightly state cost of the machine, but can safely assert that with dobbins (three) and all attachments it will not exceed £210. Being made of steel, it will be a little more costly than if made of iron, but it will be more durable and lighter.

There

There are no complicated parts—no part to get out of order that any ordinary man cannot repair. If a rivet should start, small bolts and nuts are supplied to repair the damage in a few minutes. The wings of the ploughs, as also the toe-pieces, are made of steel. These will wear, but can be replaced by fresh ones, carried with machine for the purpose.

I purpose anon making the machine to be worked by steam. The engine and boiler will be borne on the fore-carriage. By this means the cost of excavating will be reduced to a minimum, and in times of drought will be independent, as requiring no grass to keep them going.

There are many details *re* the construction of the machine which are hardly necessary to mention here. The working parts are simple and strong. For making dams or embankments this machine will be found economical, as it will displace manual labour, and when worked by steam can be made to do almost any amount of excavation.

The ploughs in front are made strong enough to cut any of the hardest soil or clay. In the case of exceptionally hard stuff to excavate, the depth can be regulated to the eighth of an inch. The machine I have here is all made of iron, and contains much unnecessary material; yet I have worked it with ten very small oxen, two of them raw steers; but in practice I would use ten oxen or eight horses. The manufacturer, Mr. R. P. Park, engineer, of Melbourne, has sent to England for the necessary steel to be used in the construction of these machines, and as soon as it arrives will proceed with the work in earnest.

Believe me,

Sincerely yours,

F. Y. WOLSELEY.

APPENDIX Y.

Mr. M. Tully to The President.

Dear Sir, 29 May, 1885.

Herewith attached I beg to hand you particulars of strata passed through in boring for water on North Darling Back Run No. 32, situated 22 miles about N. by W. from Bourke, on the western boundary of said run.

I remain, &c.,

MARK TULLY.

STRATA passed through by Tiffin's Borer on Warraweena Station.

Depth.		Description.
3	feet	Surface soil, red loam.
16	,,	Conglomerate rock.
1	,,	Salt water.
5	,,	Stiff blue clay.
18	,,	Conglomerate rock.
5	,,	Conglomerate rock.
40	,,	White chalk.
116	,,	Blue clay and ashes.
7	,,	Black drift.
39	,,	Volcanic scoria.
5	,,	Grey slaty clay.
19	,,	Red clay.
10	,,	Conglomerate quartz and flint.
15	,,	Blue slate reef.
15	,,	Grey slaty rock, hard.
1	,,	Quartz.
7	,,	Gray slate.
4	,,	Blue slaty reef, sandy.
5	,,	Quartz and flint.
40	,,	Blue slaty clay reef.
10	,,	Blue boulder, quartz, and red gravel.
112	,,	Blue slate reef.
493	feet.	

Finished on hard blue boulder too hard for steel-bits to penetrate.

APPENDIX Z.

NOTES on the Geology and Water Supply of the Interior of New South Wales.—By Rev. J. MILNE CURRAN, F.G.S.

Underground Waters.—I take it as proved that the rainfall is largely in excess of water accounted for by soakage, evaporation, or the outflow of rivers; otherwise, or as Mr. Russell puts it, we should expect to find at Bourke a river 200 yards wide and 200 feet deep. The water gets away underground, and the geological history of part, at least, of the interior will explain in what way. By the interior I mean all the country situated west of Dubbo and north of the 33rd parallel. In this country *three* well-marked and distinct geological areas may be distinguished, which for convenience I name as follows:—

I. The Great Tertiary Plains or Merri Merri Country.

II. Siluro-Devonian, or Cobar Giralambone Country.

III. Cretaceous or Warrego Country.

The Plains.—The tertiary plains extend from the Bogan to the northern boundary of the Colony, and are represented to a smaller extent towards the south-west. They are one great alluvial deposit, which show the vast amount of material removed by denuding influences from the western slopes north of the 33rd parallel.

The efficacy of denudation for a work of such magnitude may be doubted; but as we find the plains at every known depth composed of materials similar in character to deposits now in course of formation, it would be rash to say what might not have been accomplished by erosion in a country which has been above the sea since mesozoic times at the very least. Writing of Le Puy, Dr. Geikie says that his first impression was one of utter bewilderment, and upset all previous estimates of the power of rain and rivers. There is almost no amount of waste and erosion that may not be brought about in time by the influence of frost, springs, rain, and rivers. To understand this in our Colony, one has only to travel over some of the hundreds of miles of plains in the interior.

If we imagine the present surface of the interior covered with a deposit of impervious clay, to the depth of 200 feet, the plains would begin about Wellington instead of Dubbo, so far would they encroach on the high lands. The present river would of course flow on to the plains about the same place and cut a bed for itself on the new surface. Now if a well were sunk through this 200 feet of clay a good supply of water would be found in the old river bed, and further, if this well happened to be sunk on that part of the old river which we know as the "Cataract of the Macquarie" the water would rise to the surface we imagine to exist 200 feet above. Diagram II will make this clear. There is a bar of rock on the river at this point which would effectually stay the flow, while the impervious clay above would retain the water in that direction. The supply must be practically inexhaustible, for at the place where the river comes on to the new surface there is the old river bed dipping away, and as capable of absorbing water as if the new deposit never covered it.

Something

Something like what I have been supposing has actually taken place in the past, with this difference, that instead of one old river bed under the plains at one particular level, we have many and on different horizons, from the fact that the formation of the plains extended over great periods of time.

The permanence of drainage-lines is one of the most remarkable facts in the geological history of continents, and Australia is in no way exceptional in this regard. The erosive action of the western rivers and the forming of the plains may have been at work long before miocene times, when the whole southern portion of the continent was upraised some 600 feet. At that time—in the heyday of its youth—the average fall of the Macquarie was much greater than at present, and may be represented by *a—b* (Diagram I). As the plains were formed the river occupied levels as *c*, *d*, *e*, while at the *a* level would be unaltered or eroded if anything. An important point to note is that the newer beds all branch from the old ones, as in the case supposed above, and with like results, namely, that while some water will flow along the new channel, a great deal will still get away by the old bed.

It may be objected that, if the plains were formed in the way I explain, we should have not many old river beds at different levels, but one great bed of river drift that has been slowly raised while the plains were formed. We might, I admit, expect something like this if the rivers deposited alluvium to an equal depth and at the same time over the whole surface of the growing and gradually spreading plains. Then the river would not leave its channel, as when the latter was raised, the banks and surrounding country would be raised to an equal extent. It is almost needless to remark that this is not at all in keeping with our knowledge of the way rivers work in forming plains and depositing alluvium. The great bulk of the transported matter is deposited on or near the banks, so that in time the river margins and eventually the river, will be above the level of the surrounding country. The effect of this, in the end, is to alter the course of the river, only to begin again the same cycle of change. Thus, during the formation of the plains, we have old river beds, (connected with present ones) not only at different levels or on *different horizons*, but also over *separate areas*.

If my explanation be the right one, a glance at Diagram I will show what becomes of the floods that "never come down the river," and will show, too, how all the wells on the plains are down to the river drift, otherwise there is no water. On the plains north of Nyngan I have seen the water, after rain, flow *from* the banks of the creeks towards a depression a few hundred yards away, and disappear at such a rate as would make the creek "run," yet the latter was perfectly dry. A vast amount of the rainfall is absorbed in this way that would otherwise reach the *surface* creeks, and so eventually help to swell the river that would then be flowing by Bourke. At Mullungudgeree and other places the water rises in the wells on the old river drift. After the reference to the "Macquarie Cataract," further explanation of this is unnecessary.

I may observe that I have examined a great number of wells of quite another class from any referred to in this paper. They give good water for a time only, and have been called "surface wells." They are sunk in pans or beds of sand that occupy depressions in the clay. The water is merely surface water absorbed by the sand.

Giralambone Country.—The Cobar Giralambone country consists of inclined silurian slates and schists, with patches of devonian lime and sandstones. The whole area—100 to 150 (?) miles square—is considerably elevated above the plains. Bare and jagged peaks stand out over the general level. Nowhere, as far as I have seen, is the bed-rock at any great distance from the surface. The conditions under which we should expect to find underground waters here and on the plains, evidently differ as widely as the geology of the two districts.

Warrego Country.—Of the Cretaceous or Warrego country I cannot at present speak from experience; but it is clear to every geologist, from what is known of cretaceous rocks, that, as regards underground waters, we are justified in separating the areas where these rocks occur from both the Great Tertiary Plains and the Cobar Giralambone country.

DIAGRAM I.

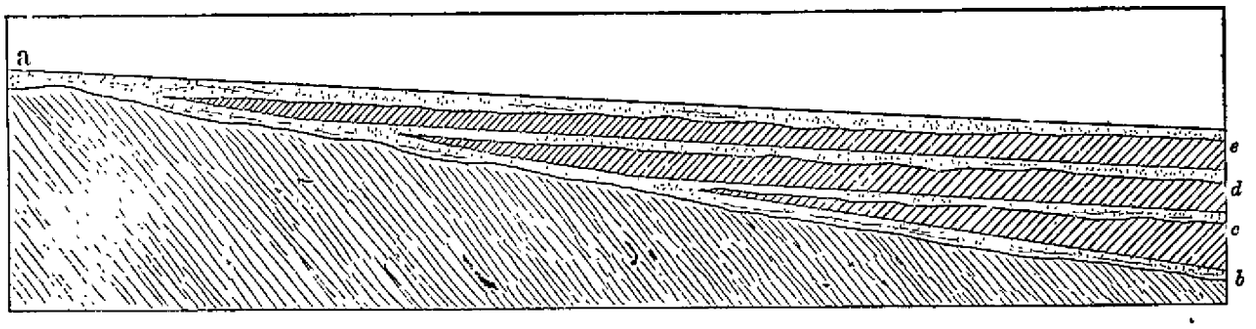
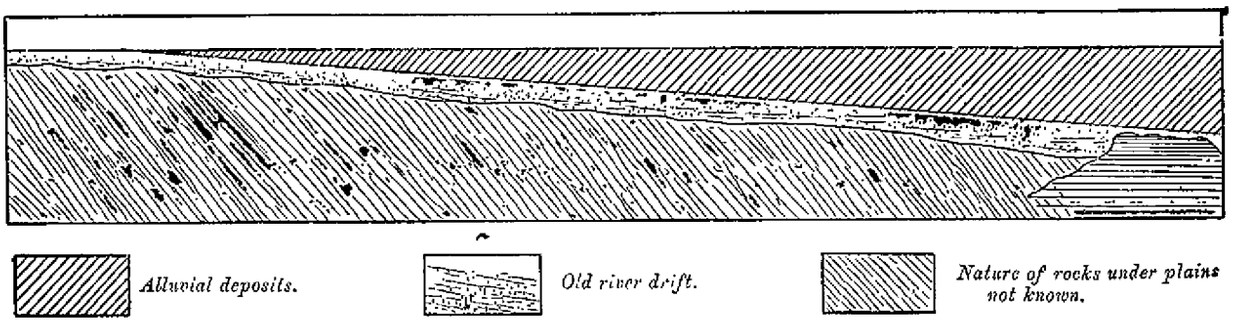


DIAGRAM II.

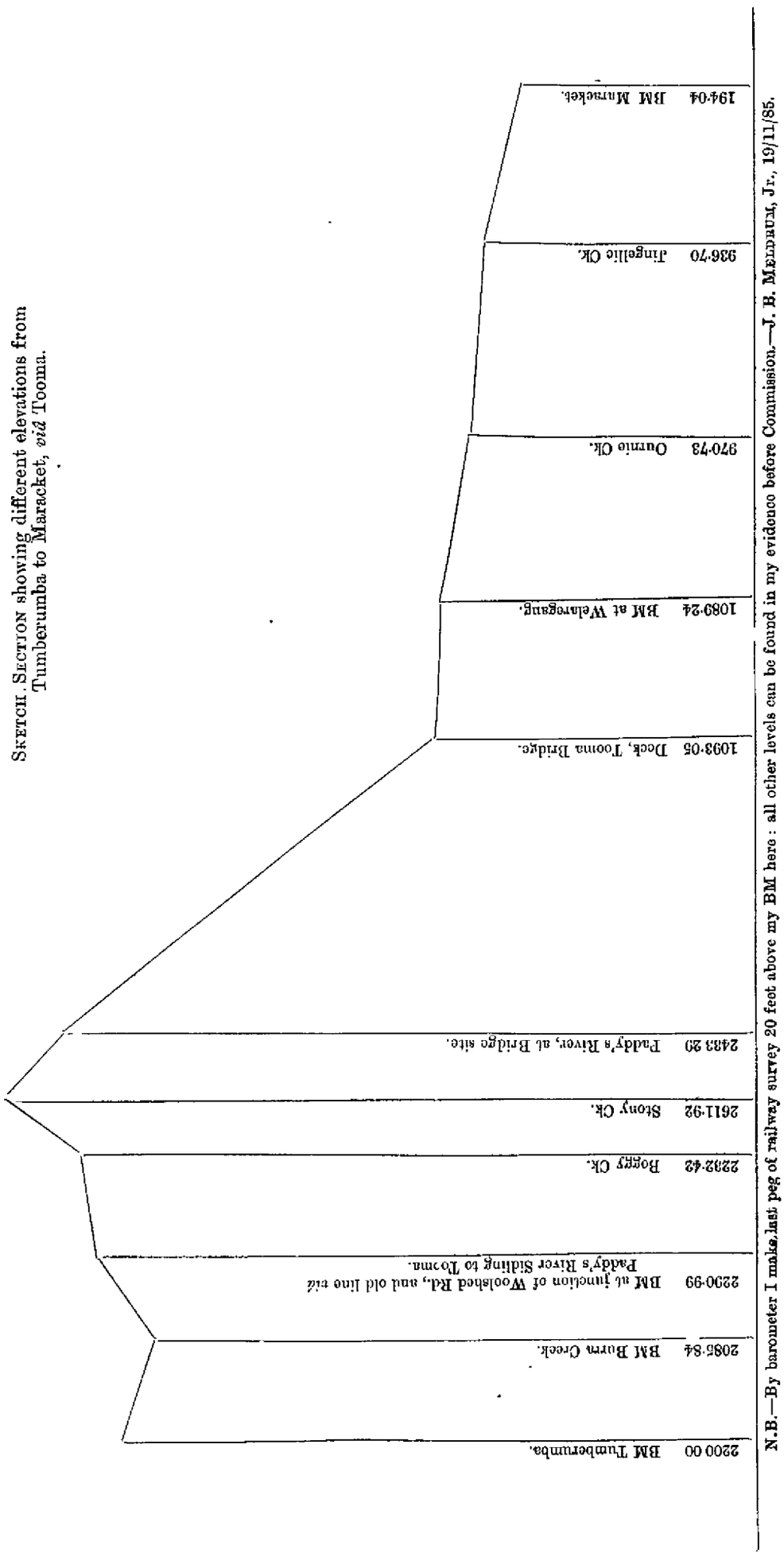


Alluvial deposits. *Old river drift.* *Nature of rocks under plains not known.*

APPENDIX BB.

APPENDIX BB.

SKETCH SECTION showing different elevations from Tumberumba to Maracket, *vid* Tooma.



N.B.—By barometer I make last peg of railway survey 20 feet above my BM here: all other levels can be found in my evidence before Commission.—J. H. MEDHURST, Jr., 19/11/85.

APPENDIX DD 1.

License.

THE Road Board of the Courtenay Road District hereby grants unto the owner or occupier for the time being of part of rural section, number hereinafter termed the licensee, full and free liberty and license at all times hereafter until such liberty and license shall be revoked, under the provision in that behalf hereinafter contained, to take and convey water by means of pipes, culverts, aqueducts, inlets, or other similar works, to be hereafter laid down for such purpose, from the public water-race, or any branch thereof, across, under, or upon the public road adjoining the said rural section, for the use of the said lands and the owner or occupier thereof, subject to the following stipulations and provisions to be performed and observed on the part of the licensee:—

1. That the connection for the purpose of conveying the water from the public water-race to the lands of the licensee, and all works and materials necessary for effecting the same, be made, done, and provided by the licensee at his expense, but subject in all respects to the approval of the Road Board or its Surveyor.

2. That, subject to the like approval, the licensee will, at his own expense, at all times, and from time to time, cleanse, amend, repair, and relay, whenever the Road Board shall require him so to do, all or any of the said pipes, culverts, aqueducts, inlets, or other works, and keep and maintain the same so cleansed, amended, and repaired, so that the same shall not become a nuisance to the public, or otherwise interfere with the public traffic on the roads under the care and control of the Road Board.

3. That the licensee will at all times hereafter indemnify and keep indemnified the Road Board, its successors and assigns, servants, agents, and workmen, of, from, and against all claims, demands, costs, charges, and expenses which may any time hereafter be made, preferred, or established against the said Board, or which the said Board may pay, sustain, or be liable for, or by reason or on account of the authorities, rights, and powers granted by this license, or in respect of the said works, or the interference with any public road by the said works, or in respect of any act, matter, or thing done, or damage occurring from time to time in relation to the same, or otherwise howsoever.

4. That the Road Board, its servants, agents, and workmen, may at all reasonable times enter upon the lands of the licensee adjoining the said works for the purpose of inspecting and viewing the said works; and no trespass shall be thereby committed by the said Board or its servants, agents, or workmen, nor any claim for compensation be made by the licensee in respect of such entry.

5. It is hereby agreed and declared that the Road Board, its successors and assigns, shall have full power and authority at any time hereafter, upon giving to the licensee seven days' notice in writing, or leaving the same upon the land of the licensee, to revoke and make void the liberties, licenses, and powers hereby granted, in which case the materials forming the said connection may be removed, and the surface of the public road made good by the Road Board at the expense of the licensee.

Granted this day of 188 , and sealed with the common seal of the Courtenay Road Board.

Chairman.

Countersigned,—

Clerk of the Board.

I hereby accept this license, and agree to observe and be bound by all the foregoing conditions thereof.

Witness to signature,—

APPENDIX DD 2.

An Act to authorize the Transfer of a certain Water-race, known as the Malvern (N.Z.) Water-race, to the Corporation of the County of Selwyn. [29th October, 1878.]

Preamble.

WHEREAS a certain water-race, known as the Malvern Water-race, has been constructed in the Provincial District of Canterbury, for the purpose of supplying water to landowners, farmers, and others, and such water-race has been hitherto maintained by the Government, and it is expedient for the better management thereof that such water-race should be handed over to the Corporation of the County of Selwyn, wherein the same is situate:

Be it therefore enacted by the General Assembly of New Zealand in Parliament assembled, and by the authority of the same, as follows:—

Short title.

1. The short title of this Act shall be "The Malvern Water-race Transfer Act, 1878."

Definition of "water-race."

2. The word "water-race" includes the land occupied by the water-race, and all streams, waters, and rights appertaining thereto, and all reservoirs, dams, tanks, and pipes, and all machinery and appliances of every kind connected therewith acquired or constructed by the Council under the authority of this Act for conveying water to or through the county. "Council" means the County Council of the County of Selwyn.

Malvern Water-race may, by Order in Council, be vested in Corporation of County of Selwyn.

3. The Governor, by Order in Council, may vest the Malvern Water-race aforesaid in the Corporation of the County of Selwyn, upon such terms and conditions as the Governor in Council thinks fit. When so vested, such water-race shall, subject to the terms and conditions mentioned in such Order in Council, be deemed to be the property of such Corporation for the purpose of all actions, suits, and proceedings in respect thereof or in relation thereto, so long as such water-race remains so vested; and the Council shall have and exercise over such water-race the powers and authorities conferred by any such Order in Council and by this Act.

Powers of Council.

4. The Council may complete, extend, and enlarge the said water-race, and may keep the same in good repair, and may from time to time do all things necessary thereto; and therein especially may do the following things:—

(1.) May make surveys upon any lands within the county;

(2.) May purchase or take, under the provisions of "The Public Works Act, 1876," land or any estate or interest therein;

(3.) May break up or dig into the surface of any public place or road within the county, and temporarily stop the traffic on any such public place or road so far as is necessary for the construction or repair of any part of the water-race, and alter any drain or sewer on or under any public place or road so far as is necessary for such construction or repair, and alter the course or level of such public place or road for such purpose;

(4.) May, with the consent of the Governor, make such water-race over or under or through any public reserve;

(5.) May alter the course or level of any stream or river, or of any ditch or drain, and take, impound, or divert the water from or turn water into any stream, river, ditch or drain, and make dams, sluices, reservoirs, or other water-race in any such stream or river.

(6.) May enter upon any lands and take therefrom any materials required for the construction or repair of the water-race;

(7.) May construct all works, buildings, and machinery, of every description and material, and generally may do all things necessary for the construction, repair, maintenance, and use of the water-race.

Any land or water so taken for waterworks shall be taken under the provisions of "The Public Works Act, 1876," and Acts amending the same.

Persons suffering damage or loss to be compensated.

5. Every person having any estate or interest in any land, water, or buildings taken under the authority of this Act, or suffering any damage by the exercise of any of the powers hereby given, shall be entitled to full compensation for the same, which may be claimed and shall be determined in the manner provided by the Third Part of "The Public Works Act, 1876;" and in any such proceeding the Council shall be deemed to be the respondent within the meaning of the said "Public Works Act, 1876."

Private land not to be entered without consent of owner.

6. Nothing herein shall authorize the entering upon any private land without the consent of the owner, except for the purpose of making surveys, or until such land is taken by the Council as above provided; but if any part of the water-race is at any time, with such consent, put on or under any private land, the Council may thereafter enter thereon to repair such part when required.

7.

By-laws as to rates and charges.

7. The Council may from time to time make, alter, and repeal by-laws prescribing the terms and conditions upon which the water-race may be used, and prescribing the rates and charges to be paid for water supplied, and may fix a penalty of not exceeding ten pounds for the breach of such by-laws.

All such rates and charges may be recovered by and in the name of any person duly authorized by the Council in that behalf as an ordinary debt in any Court of competent jurisdiction.

Penalty for taking water from water-race without consent of Council.

8. It shall not be lawful, without the consent of the Council or of some person appointed by the Council, for any person to take or divert any water from the water-race; and any person who, without such consent as aforesaid, does or causes to be done any act whereby the water in any such water-race is drawn off or diminished in quantity, shall be liable to a penalty of not more than five pounds for every day during which the supply of such water is so drawn off or diminished. The Council may recover from such person the amount of any damage sustained by reason of the taking or diverting of such water.

Penalty for damage done to water-race.

9. If any person wilfully or maliciously destroys or does any damage to the water-race, or if any person permits his cattle to trespass on the water-race and thereby any damage is done to the water-race, such person shall be liable to a penalty of not more than one hundred pounds, and in addition to pay the whole cost of restoring such damage.

Person taking water from water-race without paying charges to be fined.

10. If any person unlawfully obtains water from the water-race without payment of the lawful charges, or in other manner than as provided by the by-laws made by the Council, he shall be liable to a penalty of not more than fifty pounds.

Penalties to be recovered in a summary manner.

11. All penalties under this Act, or any by-laws made thereunder, may be recovered in a summary manner before two or more Justices of the Peace, in the manner provided by the "The Justices of the Peace Act, 1866."

APPENDIX DD 3.

MALVERN (N.Z.) WATER-RACE TRANSFER ACT 1878 AMENDMENT.

Title

A Bill intituled an Act to amend "The Malvern Water-race Transfer Act, 1878," and to confer upon the Council of the County of Selwyn special Rating and Borrowing Powers in respect of the said Water-race.

Preamble.

WHEREAS it is expedient to amend "The Malvern Water-race Transfer Act, 1878," and to confer upon the Council of the County of Selwyn, in respect of the said Water-race, special powers of rating and borrowing:

Be it therefore enacted by the General Assembly of New Zealand in Parliament assembled, and by the authority of the same as follows:—

Short title. Interpretation.

1. The short title of this Act is "The Malvern Water-race Transfer Act 1878 Amendment Act, 1880."

2. In this Act—

"The said Act" means "The Malvern Water-race Transfer Act, 1878":

"District" means and includes the lands described in the Schedule:

"Council" means the Council of the County of Selwyn.

"Counties Act, 1876," and other Acts incorporated.

3. The provisions of "The Counties Act, 1876," "The Rating Act, 1876," and "The Rating Act 1876 Amendment Act 1879," so far as they are consistent with and applicable to the objects and provisions of this Act, are hereby incorporated with and shall be read as part of this Act.

Special rate may be levied as security for loan.

4. The Council, by special order, may make and levy a special rate not exceeding 1s. in the £, on all ratable property within the district for the purpose of securing the repayment of the moneys to be borrowed, as hereinafter mentioned, with interest.

County of Selwyn may borrow £35,000 for constructing Malvern Water-race.

5. The Council, from time to time, as occasion may require, may borrow and take up at interest any sum or sums of money, not exceeding in the whole the sum of *thirty-five thousand* pounds, on the security of the said rate, for the purpose of constructing, completing, extending, enlarging, repairing, and maintaining the said water-race and the works connected therewith, and of otherwise carrying into effect the provisions of the said Act, and for paying all expenses incidental to the raising and borrowing of such moneys.

Notice of special loan to be published.

6. The Council shall publish in the district once in each week, for four successive weeks, a notice setting forth,—

(1.) The particular work proposed to be undertaken.

(2.) The sum proposed to be borrowed for such purpose.

(3.) Any special rate, or tolls, or the rents and profits of any property which it is proposed to pledge as security for such loan, not being moneys received by way of grant from the General Government, or moneys heretofore pledged as security for any loan, or appropriated to any special purpose.

Chairman to call meeting of ratepayers to consider proposal to borrow.

7. The Chairman shall call a meeting of the ratepayers of the district, to be held within the district upon a day not *less* than ten, *nor more than twenty*, days after the last publication of such notice, to consider the said proposal; and every such notice shall be published in a newspaper circulating in the district, and shall specify the time and place in the district at which the meeting is to be held.

Chairman to appoint person to preside.

8. The Chairman shall appoint one of the members of the Council elected for any riding included, or partly included, in the district, to preside at each meeting, if such member shall be willing to act; and if no such member is willing to act, or becomes incapacitated from acting for any cause, then such person as the Chairman thinks fit.

The member or person so appointed shall be called the "Presiding Officer," and he shall be Chairman of the meeting to be held in the district, and shall act as such at the taking of any poll, as hereafter provided.

After due consideration and discussion of the proposal, the presiding officer may give notice that a poll will be taken.

How poll to be taken.

9. The poll shall be taken as follows:—

(1.) The Chairman shall publish a notice setting forth the day, not less than one *week* nor more than three weeks, from the day of the said meeting on which the poll will be taken.

(2.) The Chairman shall give notice in writing to the presiding officer, requiring him to take the poll upon the day appointed.

(3.) The presiding officer shall, upon the day so appointed, proceed to take the poll in the manner provided by "The Regulation of Local Elections Act, 1876," for taking a poll at any election, and shall provide voting papers and all things necessary for taking the poll.

Second Schedule

(4.) The voting papers shall be printed in the form in the Second Schedule, setting forth the notice mentioned in the sixth section with the declaration in such form set forth, and the words "I vote for the above proposal," or, "I vote against the above proposal," legibly printed at the foot of each voting paper.

(5.) The voter shall erase one or other of the said lines, and his vote shall be deemed to be given according to the one of the said lines which he leaves unerased.

(6.) All the provisions of "The Regulation of Local Elections Act, 1876," as regards taking a poll, shall, so far as they are applicable, and except as by this section otherwise provided, apply to the taking a poll on the proposal to raise a special loan.

When resolution deemed to be carried.

10. If the number of votes given for the proposal within the district taken together exceeds the number given against it by one-fifth or more than one-fifth of the latter, the resolution in favour of the proposal shall be deemed to be carried, and the Council may proceed with the proposal accordingly; but if there is not such a majority in favour of the proposal, the resolution shall be deemed to be rejected, and the Council shall not so proceed.

Chairman to declare numbers polled.

11. As soon as conveniently may be after the result of the poll has been ascertained, the Chairman shall give public notice of the number of votes recorded for and against the proposal as above provided, and shall declare the resolution to be carried or rejected, as the case may be.

And send result of polling Colonial Secretary.

12. When any such resolution is carried, the Chairman shall send a notice thereof to the Colonial Secretary, who shall publish the same in the Gazette, and such notice so gazetted shall be evidence that the raising of the loan to which it refers has been duly authorized under the provisions of this Act.

13. The re-payment of such moneys, with interest, shall be secured to the lender or lenders thereof, upon or by debentures to be issued under the authority of this Act. Debentures.

14. The net proceeds of the said rate shall be paid and applied by the Council in manner following, that is to say— Application of rates.

Firstly—In payment of the interest on the sum or sums of money to be borrowed.

Secondly—In providing a sinking fund *of not less than one pound per centum per annum upon such sum or sums as shall from time to time be raised under the authority of this Act* for the repayment of the principal of such moneys.

THE FIRST SCHEDULE.

ALL that area of land situate in the provincial district of Canterbury, and estimated to contain by admeasurement 89,525 acres, bounded as follows:—Commencing at the south corner of R.S. 4,708, thence along the eastern boundary of R.S. 4,708 to the lower Waimakariri Road; thence along the southern boundary line of the road to the north-east corner of R.S. 15,744; thence along the eastern boundary of the said section to the north corner of R.S. 17,637; thence along the north boundary of R.S. 17,637, and south boundary of R.S. 14,865 to the Racecourse Hill and Bleakhouse Road; thence along the southern boundary of the road to the north-west corner of R.S. 14,866; thence along the western boundary of R.S. 14,866 to the northern boundary of R.S. 18,489; thence along the northern boundaries of R.S. 18,489, reserve 1,329, R.S. 10,233, 14,691, 14,970, 16,237, 12,285, 12,289, 14,854, 14,517, 8,995, 9,135, 10,181, 3,743, and the eastern boundary of R.S. 3,473 to the Homebush Road; thence along the north boundary of the Homebush Road to the Kirwee Road; thence along the east boundary of the Kirwee Road to the north-west corner of R.S. 8,894; thence along the north boundaries of R.S. 8,894, 8,866, 8,989, 6,721, to the public road; thence along the northern boundary line of the public road to the south-west corner of R.S. 5,782; thence along the eastern boundary of the Sandy Knolls Road to the south-west corner of R.S. 6,467; thence along the north boundary of the road to the south-west corner of R.S. 20,658; thence along the erst boundary of the road to the south-west corner of reserve 1,455; thence along the south-western boundary of reserve 1,455 and R.S. 22,647; thence along the east side of the public road to the north corner of R.S. 7,743; thence along the south-west boundary of reserve 720 and R.S. 8,163 and 7,795; thence along the south-eastern boundary of 7,795 and 7,569, and the north-eastern boundary of R.S. 4,962 to the north side of the Railway Reserve; thence along the northern boundary of the Railway Reserve to the east corner of R.S. 4,256; thence along the south boundary of the public road up the bank of the Selwyn River to the south-east corner of R.S. 15,024, and thence along the south boundary of the road to the north corner of R.S. 16,011; thence along the east boundary of the road to the bank of the river Hawkins; thence along the left bank of the river Hawkins to the west corner of R.S. 4,460; thence along the north boundary of R.S. 4,460 and west and north boundaries of 15,106 to the Malvern Railway Reserve; thence along the west boundary of the Railway Reserve to a point opposite to the commencing point, and thence across the reserve to the commencing point.

SECOND SCHEDULE.

Form of Voting Paper for Special Loan.

Proposal to raise a special Loan, upon which a poll will be taken on the day of , 18 .

(*Insert the notice required by the 9th section of the Act.*)

1. I vote FOR the above proposal.
2. I vote AGAINST the above proposal.

APPENDIX FF 2.

PARTICULARS of Improvements for the Conservation of Water on Toganmain.

Portion.	Description.	Value.	Portion.	Description.	Value.
	Parish of Mulburruga.	£ s. d.		Parish of Mucleay.	£ s. d.
41	Tank on portion 41, parish Mulburruga, and portion 55, parish Eilginbah.	400 0 0	21	Tank	460 0 0
55			17	Well, tank, and troughing	480 0 0
			48	Tank	500 0 0
	Parish of Toganmain.			Parish of Gundadaline.	
63	Excavation	520 0 0	100	Well, tank, and troughing	460 0 0
49	Do	180 0 0	19	Tank	180 0 0
			24	Do	800 0 0
	Parish of Singorambah.		31	Do	420 0 0
78	Tank	250 0 0	28	Do	350 0 0
35 & 36	Do	340 0 0	1	Tank and dam	520 0 0
2	Do	260 0 0	2	Do	600 0 0
10	Tank and dam	160 0 0			
	Parish of Eunanbrennan.			Parish of Dow.	
			12	Tank	260 0 0
			13 & 65	Well and troughing	500 0 0
102	Well and troughing	260 0 0	2	Tank	720 0 0
107	Tank	210 0 0	43	Do	320 0 0
50	Well, tank, and troughs	300 0 0	4	Do	280 0 0
50	Excavation	70 0 0	42	Do	460 0 0
52	Well, tank, and troughing	280 0 0	41	Do	420 0 0
46	Tank	800 0 0	3	Do	400 0 0
46	Well, tank, and troughing	400 0 0	58	Do	450 0 0
81	Tank	240 0 0	84	Well, tank, and troughing, £360; tank, £150.	510 0 0
95	Do	340 0 0			
	Parish of Clifford.			Parish of Maley.	
			85	Tank	250 0 0
64	Tank	80 0 0	1 & 3	Do	820 0 0
79	Do	400 0 0	2	Well, whim, tank, and troughing	500 0 0
9	Well, built with brick, tank and troughing.	800 0 0	100	Tank	750 0 0
	Parish of Waddaduri.			Parish of Gumblebogie.	
			12	Well, tank, and troughing	600 0 0
			16	Tank	360 0 0
74	Tank	80 0 0	37	Tank and dam	580 0 0
76	Do	160 0 0	13	Tank	200 0 0
99	Do	480 0 0	43	Well, whim, tank, and troughing	550 0 0
18	Do	500 0 0	67	Tank	360 0 0
11	Do	300 0 0	97	Do	420 0 0
70	Do	320 0 0	26	Tank and dam	380 0 0
	Parish of Puckineroy.			Parish of Wangabawgal.	
			37	Tank	500 0 0
60	Well	320 0 0	94	Do	220 0 0
60	Tank	220 0 0	38	Do	350 0 0
	Tank on reserve No. 1,006	680 0 0	10	Do	450 0 0
56	Well and troughing	300 0 0	28	Do	80 0 0
54	Tank	350 0 0	4 & 65	Well, whim, tank, and troughing	480 0 0
23	Do	420 0 0	16	Tank	200 0 0
26	Do	480 0 0	13	Do	100 0 0
49	Do	100 0 0	46	Tank and dam, parishes Wangabawgal and Gundadaline.	600 0 0
12	Do	500 0 0			
	Parish of Eilginbah.			Total amount expended on Water Conservation	£ 29,680 0 0
1	Tank	280 0 0			

At 31st December, 1884:—72 tanks, 15 wells.

Sydney: Thomas Richards, Government Printer.—1885

MEMO.:—

The Diagrams and Plans connected with the First Report from the Royal Commission on the Conservation of Water will be found in a Supplementary Volume.

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

ROYAL COMMISSION—CONSERVATION OF WATER.

SECOND REPORT

OF THE

COMMISSIONERS.

ORDERED BY THE LEGISLATIVE ASSEMBLY TO BE PRINTED,
30 *June*, 1886.

SYDNEY: THOMAS RICHARDS, GOVERNMENT PRINTER.

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[15*s*.]

1886.

NEW SOUTH WALES.

ROYAL COMMISSION—CONSERVATION OF WATER.

SECOND REPORT OF THE COMMISSIONERS.

To His Excellency the Right Honorable CHARLES ROBERT, BARON CARRINGTON, Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies, &c., &c., &c.

MAY IT PLEASE YOUR EXCELLENCY,—

In our First Report we drew your attention to the natural facilities which exist for the utilization of the flood-waters of the Murray over a large portion of the fertile soil which lies between that river and the Murrumbidgee, and to the advantages which might be expected to result therefrom. We also informed your Excellency that we had it in contemplation to confer with the Royal Commission appointed by the Government of Victoria to report upon the question of Water Supply, with a view to ascertain a basis upon which the Colonies of New South Wales and Victoria might agree to the diversion and utilization of the flood-waters of the Murray in their respective territories. In the fulfilment of this intention we met the Members of the Royal Commission of Victoria in conference at Melbourne, on the 22nd and 23rd of January, and in Sydney on the 5th and 6th of May.

The first deliberations of the Conference were embarrassed by the want of accurate information on several points; as, for example, the quantity of water required to maintain navigation; the quantity available for distribution for purposes of stock, agriculture, or mining; the quantity contributed by the drainage area of New South Wales and that of Victoria; the extent to which water is being and will be diverted from the Victorian tributaries of the Murray; the extent to which flood-waters can be impounded by works of storage, and the extent to which they can be utilized by one Colony or the other. The attention which the Public Departments of this Colony has hitherto been called upon to give to our rivers has had reference chiefly to the removal of obstructions to navigation; and any information which can be obtained in regard to the discharges of the rivers is fragmentary. Under these circumstances the members of both Commissions were fully agreed as to the propriety of making a thorough examination of the Murray and its tributaries, as by that means only can be obtained the data upon which action for the common benefit can be taken. It was, therefore, at an early stage of their deliberations, unanimously resolved—

> "That the Governments of New South Wales and Victoria are invited to take joint and immediate action for a thorough examination of the Murray River and its tributaries, and the accurate gauging of the discharge at various points."

We

We forwarded a copy of this resolution to the Honorable the Colonial Secretary on the 24th of February, with an intimation of our willingness to co-operate with the Commissioners for Victoria in making the inquiry. The Government of Victoria have expressed their readiness to bear half the cost of the examination.

We assume that the sites for weirs and other works which may have to be constructed to conserve or to divert water, will be determined upon after a careful examination by competent engineers of all the circumstances which should govern their selection, in view of the requirements of the Colonies to be benefited, and the cost at which the benefits could be secured. Works of this character would, in the first instance, require the sanction of the Parliaments of New South Wales and Victoria, and we assume that, the necessary appropriations having been made, the construction of them would be devolved upon the joint Trust which we recommend shall be called into existence, and in which the control of the Murray shall be vested. It will be seen, from their sixth recommendation of the final resolutions, that the Commissions are of opinion that the amount of benefit which each Colony could derive from any particular work should form the basis upon which should be ascertained the proportion of cost which the Parliament of each Colony would be invited to provide.

The 5th section of 18 and 19 Victoria, chapter 54, enacts "that the whole watercourse of the River Murray, from its source to the eastern boundary of the Colony of South Australia, is and shall be within the territory of New South Wales." The section also empowers the Legislatures of Victoria and New South Wales to make regulations for the levying of Customs duties on goods imported by way of the Murray, and for the navigation of the river by vessels of the two Colonies respectively. New South Wales has, therefore, the legal right to divert the flood-waters of the Murray to any extent which may be deemed expedient, so long as the navigation of the stream is not impaired by such diversion. Thus, for example, we believe that the Government of New South Wales would be acting strictly within their statutory rights if they were to cut channels into the northern bank of the Murray, to allow the flood-waters of the river to be utilized in the country to the north of the river; but we do not acknowledge that Victoria has the same right, although she has assumed to exercise it by deepening the Gunbower Creek, which is a Victorian effluent of the Murray.

We recognize, however, that the question cannot be dealt with in a manner which will be satisfactory to both Colonies if reference is had solely to its legal aspect. The largest and most advantageous use of the water must depend upon the construction of works of great magnitude, designed to conserve water on an extensive scale, so as to maintain a constant and, as far as practicable, an equal volume of water in the channel of the river, and also, upon the construction of works to increase the height of the river at certain points, to divert by means of gravitation, through artificial channels, so much of the water as may be available for irrigation, mining, pastoral, or other uses in the two Colonies. No work of this character could be constructed without the full consent of both Colonies within whose territory some portion of it must be placed, for physical and political considerations would frustrate the completion of any such works projected by New South Wales if they were objected to by Victoria. It is furthermore certain that the cost of the works necessary for the improvement of the river would be very great; and every consideration of policy and right feeling leads to the conclusion that the question of improving the Murray and utilizing its flood-waters should be dealt with on the durable and satisfactory basis of mutual help for mutual benefit.

We are fully aware that no action which it might be in our power to take could abrogate the legal rights of ownership in the Murray, which, as we have seen, is by the Constitution Act vested in the Legislature of New South Wales. We nevertheless did not desire to insist upon such an extreme view of our statutory position as should preclude the consideration and recommendation of any scheme which might seem to be equitable and advantageous to the two Colonies. It appears to us that, for reasons, some of which are indicated in the last preceding paragraph, and others not less cogent which will readily suggest themselves, that for New South Wales to insist upon her statutory right to the exclusive ownership of the Murray—qualified as that right is by co-ordinate powers in regard to navigation and the collection of Customs duties by the Government of Victoria, and by the riparian rights of the inhabitants of Victoria who are settled upon the southern bank of

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the stream—is to take up a position which may embitter the future political relations of the two Colonies, and which must injuriously retard the development of their material interests. Finding that the Commissioners for Victoria are prepared to recommend that the Mitta Mitta and the Kiewa shall be dealt with as an integral portion of the Upper Murray, we, on our part, are prepared to recommend the waiver of the advantage of our superior legal position, in order to secure, as far as may be practicable, the utilization of the waters of the river which now flow wastefully into the sea. The annual money value of the water now lost would be represented by millions of pounds sterling, and we anticipate that the examination of the river which we have recommended will establish the fact that it is quite within the power of engineering skill to devise means for the conservation and distribution of the flood-waters of the Murray to an extent which, on self-supporting economical conditions, will endow with perpetual fertility large districts in both Colonies—districts which, however rich may be the soil, must, without irrigation, remain useless for the purposes of agriculture.

As the legal position of the question contains no sufficient basis on which to form an agreement which would be accepted by the two Colonies as satisfactory, attention was next directed to the amount of water contributed by New South Wales and Victoria to the Murray, with a view, after providing for compensation water, of authorizing each Colony to divert from the river the proportion of the surplus to which it would be entitled on the basis of contribution. The deliberations of the Commissioners, however, in this direction disclosed numerous important and, as it it appeared to them, insuperable difficulties. Thus, for example, it would be well-nigh impossible to reconcile the conflicting claims which have been, and would be, put forward on behalf of each Colony as to the quantity of water contributed from its respective drainage areas. The extent only of the drainage areas form no criterion as to the quantity of water which flows from them; for it is obvious that while a rocky and precipitous country will discharge a very high percentage of the rainfall into its streams, a district whose soil is flat and porous will absorb the whole of a moderate rainfall. The question, as a matter of calculation, is rendered still more difficult by the inequality of the rainfall itself, and that within comparatively limited areas. The rain observations on the Upper Murray are confined, in New South Wales, to two stations; and while the record at Kiandra gives the fall at 61 inches, that at Albury shows only 26 inches per annum. The number of stations at which rain records are kept will have to be greatly multiplied, and the records continued for many years (some meteorologists would say sixty at least), before it would be possible to form a reasonably approximate estimate of the mean average rainfall. It has not unfrequently happened that, while a large part of one Colony has been deluged with floods, a considerable area of the other has been parched up with drought, and it would not be practicable to gauge the quantity of water contributed by floods other than that flowing down the channels of tributary streams. If it were possible to overcome these difficulties, and to deal with the waters of the Murray on the principle of a debtor and creditor account, we anticipate that, owing to differences in the configuration of the different districts bordering on the stream, and to the variety of local interests, such an arrangement would break down under the political contention which it would be sure to engender.

The principle upon which the tributaries of the Murray should be dealt with has also necessarily engaged our attention. In our first report we have recorded (page 66 and sequel), we hope with sufficient clearness and fulness, our reasons for thinking that the presumptions of English law in regard to riparian rights are not applicable to the conditions of New South Wales, where, in too many cases, what are called rivers are actually the dry channels of watercourses, which need to be converted into canals; and this opinion has led us to the conclusion that each Colony must be allowed to deal with the tributaries of the Murray in such manner as will best conduce to its own development, with the sole reservation that a certain proportion of the water contained in those streams must be allowed to flow into the Murray. For the sake of convenience, we have called this proportion of the rivers' discharges "compensation water;" for by this means the residents on the banks of the Murray or of any of its tributaries will be "compensated," or, more correctly speaking, protected from injury, which would be inflicted upon them if works for storage higher up the stream were to impound the whole supply. This principle of augmenting the supply and regulating the flow of water

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in any particular stream seems to us to preserve all that is valuable in the doctrine of riparian rights, and, as the Colonies advance in population and wealth, and are thereby enabled to carry out works for this description of river improvements, it will stimulate production to an extent now hardly dreamed of, and may be the means in years to come of completely altering the face of the country. A just application of the principle will safeguard the rights of South Australia, which we recognize to be as valid as our own; but the logical outcome of legal presumptions in regard to the riparian rights, if Queensland, New South Wales, Victoria, and South Australia, were one community, would enable the last named Colony to insist on the uninterrupted flow of an immense proportion of the whole rainfall of the Continent, simply because the waters of the Murray run through her territory to the sea. As we could not think that the Legislature will for ever permit the rainfall of that wide extent of our Colony which lies to the west of the Main Dividing Range, which is collected in the Murrumbidgee, the Lachlan, and the Darling, with its important tributaries the Macquarie, the Castlereagh, the Namoi, and the Macintyre, to be unutilised, in so far as their flood-waters are concerned; neither could we feel justified in attempting to interpose any barrier to action on the part of Victoria for the utilization of the flood-waters of her tributaries to the Murray.

It will be seen from the third resolution of the Conference that we have agreed to recommend that the waters of the river Murray, including the whole of its tributaries above Howlong, shall be deemed to be the common property of the two Colonies; and we trust that it will appear to your Excellency, and to the Parliaments of the Colonies interested, that the recommendation is based upon equity and the dictates of sound policy. All other solutions of the matter which have engaged our thoughts have been so full of complexity, and fraught with so many technical difficulties, that we could entertain little hope of their being made readily intelligible to popular comprehension, or of their commending themselves to the conscience and judgment of the communities which dwell on either side of the Murray, with whom, through their representatives in Parliament, the ultimate settlement of the matter must rest.

We hope, also, that the proposal to create, under Legislative sanction, a joint Trust, in which should be vested the control of the Murray, is one which will be regarded as being of a simple and practicable character. The functions of that body would be to make recommendations as to the sites and character of storage works, weirs, and off-takes, to supervise the construction of such works, and to authorize the diversion of water from the river, subject to statutory limitations designed to secure and guard the rights of each Colony. In times of high flood the quantity of water is greater than can be dealt with by any improvement of the river itself, but an examination of the country may show that it is possible to divert water in such cases to natural depressions or creeks at a distance; and, to meet such cases as these, we recommend (Res. 5) that the Trust shall be empowered to fix levels at which it shall be at the option of either Colony to appropriate flood-waters as it may deem expedient, without the same being debited against them. By this means it is hoped that the injury resulting from high floods may be mitigated, while, at the same time, districts adjacent to the Murray will be benefited.

The resolutions of the Conference appear to us to be sufficiently perspicuous not to require further explanation, and we therefore submit them with our recommendation that they may form the basis of a treaty between New South Wales and Victoria. They are as follows:—

1. That a joint Trust shall be constituted, equally representative of the Colonies of New South Wales and Victoria, in which shall be vested the control of the whole of the Murray River and its tributaries from its source to Howlong, to be known as the Upper Murray; and of the whole of the Murray River from Howlong to the eastern boundary of the Colony of South Australia, to be known as the Lower Murray; and such Trust shall have power to regulate all diversions of water from the river and tributaries within its jurisdiction.
2. That the waters of the tributaries of the Lower Murray, except such proportions thereof as shall, under the direction of the Trust, be required as compensation water for the main river, may be diverted and used by the respective Colonies through which they flow.

3. The whole of the waters of the Upper Murray and its tributaries, and the whole of the waters of the Lower Murray, shall be deemed to be the common property of the Colonies of New South Wales and Victoria. And, subject to the reservation of such compensation water as the Trust may from time to time determine, each of the said Colonies shall have the right to take and divert one-half of such water at such point or points as may, with the sanction of the Trust, be fixed on as most suitable for the requirements of such Colony. Provided always that the totals of the quantities so diverted by the two Colonies, when the whole surplus (after providing compensation water as above) is utilized, shall be equal.

3. That all natural diversions of water from the Murray shall be gauged under the direction of the Trust, and the portion of such diversions not returned to the channel of the main river shall be debited to the Colony into which such water is diverted, in the same manner as if such diversion had been made under the last preceding section.

5. That the Trust may fix and determine levels to be known as the high-flood levels of the Murray, and may make such regulations for the disposal of water flowing above such levels as to it shall seem expedient.

6. That works for the storage and regulation of the waters of the Murray may, under the supervision of the Trust, be constructed at the joint cost of the Colonies of New South Wales and Victoria, such cost to be borne by each Colony in proportion to the benefits derived by it from such works.

7. That, so far as possible, the two Colonies shall take united action in respect of all works intended to provide for the utilization of the Murray waters.

8. That the Trust shall consist of not more than six members, three of whom may be appointed by the Government of New South Wales and three by the Government of Victoria, such members to hold office for terms of not more than five years. The expenses of the Trust and its officers to be defrayed by the two Colonies in equal proportions.

9. That a Bill, embodying the above resolutions, shall be prepared under the supervision of the Water Supply Commissions, for submission to the Parliaments of New South Wales and Victoria. The Government of each Colony, having approved of the measure, shall be requested to secure for it the earliest possible consideration by its Legislature.

10. That the Governments of the respective Colonies of New South Wales and Victoria shall be requested to hold themselves bound, *ad interim*, by the provisions of the above resolutions until they shall be dealt with by the Legislatures of both Colonies.

Capital has been invested in steamers, barges, wharves, and warehouses, and the facilities for communication and the transport of commodities afforded by the Murray to the dwellers upon its banks and in districts more remote have been considerable, but the necessity of navigation is being gradually superseded, and it is by no means improbable that, before the time arrives for joint action on the part of Victoria and New South Wales in the construction of weirs, anything like the through navigation of the Murray will be abandoned as unprofitable. We have not been able to ascertain the extent and value of the river-borne traffic, inasmuch as our Customs returns from the stations on the Murray do not specify the value of commodities carried across the river at the different points as distinct from that of those brought by the steamers. The river may be said to be navigable as far as Albury; but as a matter of fact there has been no steamboat traffic between Tocumwal and Albury during the last five years. The requirements of the district, so far as New South Wales is concerned, are met by the railway to Albury, and that which is projected to Corowa. Echuca, or Moama, may therefore be said to be the head of navigation; but it appears probable that when the railway now approaching Swan Hill is opened for traffic, that place will afford the most direct means of communication with Melbourne, and will therefore arrest the river-borne trade which now passes it for the railway at Echuca. The continuation of the line from Hay to Wentworth may be expected to diminish the amount of the river traffic;

traffic; and the importance of navigation, so far as the Murray is concerned, may also be still further lessened by the further development of the railway systems of South Australia and Victoria. The following statement, obligingly supplied by the Collector of Customs, confirms us in the opinion that navigation is steadily declining in importance.

Number and Tonnage of Vessels cleared at Moama, Swan Hill, and Euston :—

Year.	No.	Tonnage.
1881	182	43,115 tons.
1882	151	37,493 ,,
1883	146	32,482 ,,
1884	122	22,368 ,,
1885	118	21,027 ,,

No steamboat traffic to Albury, Howlong, Corowa, Mulwala, and Tocumwal.

The mercantile interests of Victoria are still largely concerned in the navigation of the Murray; but we think there is good reason to doubt whether even Victoria would be willing to incur the enormous expense of constructing locks as well as weirs for the maintenance of navigation as it is now carried on. So far as the interest and convenience of the inhabitants living on the banks of the Murray are concerned, the construction of weirs to raise the height of the river would rather increase than diminish their facilities of communication, and the navigation of the river in sections is compatible with the fullest utilization of its waters for the purposes of agriculture. But in view of the state of transition in which the border traffic is at present, we are not willing to make any recommendation in the direction of expenditure to increase facilities for navigation.

On the occasion of our visit to Victoria, we had, by the courtesy of the Commissioner for Water Supply in that Colony, an opportunity of inspecting several of the principal works in connection with schemes which have been devised for supplying water to the arid districts of Victoria, and we now submit the information we were able to obtain :—

In order to afford a clear conception of the present state of the water supply question in the country districts of Victoria, it is necessary to describe briefly the measures under which the subject has reached its present stage.

Early in 1880 Messrs. Gordon and Black were instructed—1st, "To inquire and report as to the feasibility of providing, at a reasonable expense, a supply of water to the northern plains, for domestic purposes and the use of stock"; and 2nd, "as to irrigation." In the preparation of projects dealing with the former branch of the subject, Messrs. Gordon and Black aimed at bringing a supply of water for domestic use and for stock within a maximum distance of about 3 miles throughout the various districts dealt with. It was proposed to attain this object by providing a system of watercourses and tanks at intervals of 6 miles. The reports and plans showing how this could be accomplished have in the main been adhered to in the works already constructed under the various Waterworks Trusts, and there seems little doubt that they will supply the groundwork of nearly all the works still to be carried out. The projects included the utilization of a large proportion of the waters of the Wimmera, the Avon, the Avoca, the Loddon, the Campaspe, and the Broken Rivers, and the whole of the ordinary supply of the Goulburn was proposed to be diverted, partly for stock and domestic use, but chiefly for irrigation. In short, all the Victorian tributaries of the Murray which flow through the northern plains, with the exception of the Ovens, were dealt with in a comprehensive manner. The general principle recommended was that weirs should be constructed across the rivers and their principal affluents, and that supplies of water should be directed along effluent creeks, thus making use of the natural channels for distribution purposes. When natural channels were not available artificial distributaries were proposed, and a permanent supply was to be maintained by the construction of tanks and dams, which were to be filled from time to time from the distributaries. There is no doubt that, for the purpose of affording a supply of water for domestic purposes and for stock, the arrangements proposed

were

were the most economical which could have been devised. A striking instance of the splendid results accomplished by the works carried out is afforded by those of the Wimmera district. Until the end of last year the amount expended on the works in charge of the Wimmera United Waterworks Trust was about £130,000, and it is estimated by leading men in the district that the increase in value of the land due directly to the water supply provided is over a million sterling. Land which before the works were constructed could not be sold for more than 25s. per acre now readily brings from 50s. to 80s. per acre. Speaking generally for all the districts in the northern plains in which water has been supplied by the projects of Messrs. Gordon and Black, the direct result of this water supply has been an increase of £1 per acre on an average, on all the land benefiting by it.

Another most important result of these works has been the promotion of settlement on the land. Formerly, settlers of moderate means were reduced to the greatest straits, and in many cases ruined through want of water in dry seasons, and this occasionally happened in years when there was sufficient grass to maintain stock. In the Wimmera district in particular the attempt at settlement was considered a complete failure, and until the time when the water conservation works were initiated the settlers on small holdings were selling off their properties at a serious loss and leaving the district. The beneficial effects attending the opening of the works exceeded the most sanguine expectations. Small freeholders who had been endeavouring to sell their land at once relinquished such intentions, and not a few who had left the district returned and purchased land at enhanced rates. The effect of the works in the districts of the Loddon United Water Trust and the Echuca and Waranga Trust has been similar though perhaps less striking; but in all cases the results of these works for water conservation and supply have been to promote settlement, to increase production in a remarkable degree, and to greatly enhance the value of the land.

It seems now scarcely credible that when it was proposed to act on the recommendations of Messrs. Gordon and Black, and to proceed with the damming of rivers, the improvement of creeks, and the excavation of new channels, the projects were in many cases met with ridicule from the very persons who have benefited so largely from the works. The folly of the objections urged might be passed by, were it not that circumstances tend to show that similar objections would be raised by persons similarly situated in New South Wales. Of the objections raised, the only one which was even in a moderate degree plausible was that, on account of the dry and porous nature of the soil, any water diverted from the rivers would be lost before it could flow sufficiently far to be of any service. In the Wimmera district in particular it was alleged that, owing to the spongy nature of the subsoil, the effect of floods is perceptible in the increase of vegetation for two, or even in some cases three years, and the wildest conclusions regarding the absorptive power of the soil were based on this statement. Theorists who advanced such opinions entirely lost sight of the fact that canals running through alluvial soil naturally tamp up crevices in their beds and banks by the deposition of material in a finely-divided state, and that this has been borne out by experience in many countries. As was expected by those who were competent to judge, the loss of water from the channels has been almost inappreciable. Mr. Stuart Murray states that in some of the longest channels the loss does not exceed 10 per cent. on the whole length. The total length of the channels either constructed or improved by the Wimmera United Water Trust, until the end of 1885, was 318 miles, and this includes one of 64 miles in length, another of 60 miles, another of 48 miles, and a fourth of 40 miles. In every case the action of the channels has been satisfactory, so far as the small proportion of loss is concerned. Still, it is to be remembered that the channels in operation are main distributaries, and that in all cases where old creek beds could be made use of they have been brought into requisition. In the case of water running in channels of considerable size, or in old creek beds which have been subjected to a long process of natural puddling, the loss is much less in proportion than it would be in small channels of the description of irrigation laterals. Until the present, only channels of the former types have been brought into use, but it is expected that in the various Water Trust Districts the country will eventually be intersected in all directions by minor distributaries.

In the various projects which have been carried out for the water supply of the country districts, both public and private tanks for storage necessarily play an important

important part. As occasion requires, these tanks are filled from the distributaries, and those constructed at the public expense in the Wimmera district are in all cases fenced in, and are each provided with a force-pump. Troughs are provided for the use of stock, but no establishment is maintained; so that persons wishing to water stock must themselves pump the water. Owners of tanks are on application permitted to fill them whenever a supply can be spared; but such tank-owners who wish to obtain a supply from time to time from a distributary are required to pay the cost of a stop-gate on the distributary at the point of offtake. These stop-gates, which are simple and inexpensive in construction (*vide* plate), are provided with padlocks, which are opened only by employés of the Trust after the application for a supply has been granted. When the distributary is in cutting at the point of off-take the required supply is allowed to run over the bank, which is lowered on the upstream side of the stop-gate for this purpose; but when the distributary is in embankment a pipe outlet is used.

Having described the general principles on which the works for water supply in the northern plains of Victoria are constructed and managed, it remains to mention the more important details of some of the projects carried out in the districts visited by the Commission. The Wimmera scheme is the most important of these, in so far that it provides for the district which is most liable to severe droughts. The project as prepared by Messrs. Gordon & Black was designed to provide for a tract of country 2,750 square miles in extent; and, besides ordinary distribution channels and storage tanks, it included a cut uniting the east and west branches of the Wimmera, and another from this river to the Richardson. The works on the Wimmera are of special interest, on account of the general resemblance of the conditions existing on that river to those in the case of the Macquarie, the Narran, and other rivers and creeks in New South Wales. In the Wimmera we have an intermittent stream which depends on a hilly tract of country for its supply, but which flows chiefly through alluvial plains till it is lost in a series of swamps, or, in exceptionally wet seasons, till it reaches Lake Hindmarsh. Not only is there no reliable record that the flood-water of the Wimmera ever reached the Murray, but there is no proof that it has gone beyond Pine Plains, about 25 miles north of Lake Albacutya, and it has reached that place on only two or three occasions since the country was first explored. The two main streams—the eastern and western branches—which form the river Wimmera, above Longerenong, have catchment areas of 790 and 550 square miles respectively. Comparing this total catchment with the effective catchments of the Macquarie and the Namoi, we find that it is less than one-seventh of the former, and considerably less than one-third of the latter. In the hilly portion of the basin of the Macquarie the mean rainfall is over 23 inches, and in the corresponding portion of the basin of the Namoi it is nearly 22½ inches. From the available information, it appears doubtful whether the average rainfall on the upper parts of the basin of the Wimmera exceeds that of the Macquarie or the Namoi; and it may therefore be assumed that, roughly speaking, the discharge of these rivers is in proportion to their effective catchment areas. The Wimmera scheme, as already mentioned, was designed to afford a supply to an area of 2,750 square miles, and there is little doubt that expectation on this head will be realized if not exceeded. The tract of country between the Macquarie and the Bogan, which is at least as well adapted for the distribution and storage of water as the Wimmera district, is roughly 180 miles in length by 30 miles in width, or equal to an area of about 5,400 square miles. To supply this area with water, we have a river possessing a catchment more than seven times as great as that which can successfully supply an area of 2,750 square miles. In the short period during which the Wimmera works have been in operation they have, as we have shown, increased by one pound per acre the value of the land benefited; and it may reasonably be asked why equal results should not be obtained in this Colony by similar works on the Macquarie and other similar rivers. Supposing that the works in the Wimmera district will cost altogether £150,000—and there is no reason to suppose that that amount will be exceeded—there is every reason to conclude that works can be constructed on the Macquarie at double that amount which will give double the supply. Judging, then, from the result achieved in the Wimmera district, it is a fair conclusion that a judicious expenditure of £300,000 in diverting supplies from the Macquarie and distributing them through the district between that river and the Bogan would result

result in increasing the value of the land by about 3½ millions sterling. The Macquarie is only one of a large number of rivers of New South Wales which could be dealt with in the same manner as the Wimmera.

The principal weirs on the Wimmera, are the Dunmunkle Weir, at Glenorchy, which holds back the water to a distance of about 3 miles, and diverts a supply down Swede's Creek and Dunmunkle Creek; the Ashen's and Tarrambac Weirs, which divert supplies into the corresponding creeks bearing these names; and the Doven Weir, near Horsham, which is intended to provide a supply for a tract of land about 200 square miles in extent, and having a general level of about 50 feet above the river. The most important part of all these weirs is a timber framework, and this is backed by a filling of puddle and earth. The falling water in some cases, as at the Dunmunkle Weir, expends its force on a water cushion; while in others, as at Doven, the force of the water is broken by a series of timber steps. The excellent though primitive method of raising the crests of the weirs by drop-bars is generally adopted. The bars in these cases are strong battens, which fit into timber grooves, and are easily lifted by hooks provided for this purpose.

This style of construction, besides being admirably suited to sites where, as in the Wimmera district, rock foundations cannot be obtained, has also the advantages of economy and simplicity. Such weirs can be built by ordinary workmen without any expensive appliances, and from materials obtainable in the neighbourhood. Three of the Wimmera weirs—the Doven, the Longerenong, and the Yarrambiac—are shown in detail in the appended plates. These are selected not as the most important, but as being probably the best examples of this style of construction. The Doven Weir in particular is considered a model of its class. The Dunmunkle Weir, the most costly, and one of the most important in the Wimmera district, has a crest length of 290 feet, raises the level of the river to 19 feet above the bed, and is capable of passing 8,000 cubic feet per second before the banks would be overflowed; but it cannot be considered in any way an example, as material alterations and repairs had to be made on two different occasions.

The skeleton plan of the Wimmera district (*vide* plate), showing the manner in which the country is being covered with a network of channels, gives an excellent idea of the great work done by a very limited supply of water. All these works are managed, and the majority of them have been constructed by the Wimmera United Waterwork Trust, whose jurisdiction includes the whole of the Wimmera River from above Glenorchy. Questions regarding the payment of rates for the water supplied are still in an unsettled state; but in the case of public tanks, and of the arrangements for supplying water from them, the cost of maintenance is paid by the Shire Council.

In the Loddon scheme which, as originally designed, was intended to provide for a district of 1,273 square miles in extent, the leading feature is the massive concrete weir across that river at Bridgewater. The site selected for this weir is a dyke or a bar of basaltic rock extending across the river, and which already formed a natural dam. This is a style of foundation which can be obtained on several of the rivers of this Colony, and particularly on the Darling. The Bridgewater Weir, the general plan and the cross section of which are shown in the Appendix, is used not only to divert a supply for stock purposes, but also to provide water power for a flour-mill situated a short distance down the river. The power thus obtained, and which is made available by the use of two turbines, is a mere fraction of that which could be made available on the Barwon at Brewarrina. The actual area of the Loddon United Trust District is 704,000 acres and the extent provided for by the work in existence is about 500,000 acres. It should be remembered that this provision of permanent water for half a million acres of land is made from a supply which was formerly lost entirely in ordinary seasons before it could reach the River Murray. Not only so, but the catchment area from which the supply is obtained is less than one-fifth that of the Macquarie at Dubbo, and considerably less than half that of the Namoi at Gunnedah.

The principal work carried out by the Loddon United Water Works Trust, in addition to the Bridgewater Weir and the channels depending on it, are the Kinypaniel Weir and the supply channels, which, in conjunction with the Kinypaniel Creek, conduct the waters of the Loddon to a series of lakes in which a permanent supply is by these means maintained. The Kinypaniel Weir, like those constructed by the Wimmera Trust, is of timber, and is provided with a scouring channel

 through

through the centre of the weir. A cross section of the weir along the centre line of the channel is given in the Appendix. The general arrangements of the Loddon, Campaspe, and Gunbower Schemes, and the extent to which the districts benefited by them are being covered with a network of distributaries, are shown in the skeleton plan given in the Appendix.

The work carried out, or proposed, in the Echuca and Waranga Water Works Trust District are of great interest on account of the successful work already done, but much more so on account of the importance of the object aimed at. At present the entire supply of water is obtained by pumping from the Goulburn River, near Murchison, and the system of distribution includes 80 miles of main channel and 110 miles of minor distributaries—the most important of the latter being the Wanalta Channel, which is 34 miles in length. The pumping machinery consists of two 26-inch centrifugal pumps, which were guaranteed to deliver 20 million gallons per day of 24 hours. These pumps are worked by compound engines which develop 230 indicated horse power. The total cost of the pumps and machinery in position was £7,000, and the cost of working, exclusive of interest on the plant, is reckoned at from £1,800 to £2,000 per annum. The pumps are actually delivering 40 cubic feet per second, and if it be assumed that they work sixteen hours per day, and 240 days in the year, the total quantity delivered in one year will be 552,960,000 cubic feet. It will be fairly correct to set down the gross cost of working at £2,000 per annum, and at this rate the cost of pumping will be at the rate of 13,824 cubic feet for one shilling, or 7,200 gallons for one penny.

While in the Wimmera scheme the natural channels are utilized to a very large extent as distributaries, the distributaries of the Goulburn supply are all artificial with the exception of a portion of the Wanalta Channel. The reason for this difference is obvious. In the Wimmera District irrigation except on a very limited scale, is impossible on account of the insufficiency of the supply of water; whereas in the Echuca and Waranga Trust Districts irrigation is intended to be carried out on a very extensive scale, so that in the construction of distributaries it was necessary to have them aligned, with this object in view. Besides, natural channels were not available to the same extent for the distribution of the Goulburn water as they were in the case of the Wimmera. The channels at present in use or under construction, are estimated to afford an ample supply for domestic and stock purposes throughout the Trust District, which includes an area of over 1,000 square miles, and to furnish in addition sufficient water for the irrigation of from 7,000 to 10,000 acres. Up to the present only a very small area has been irrigated, but as much as could be expected under the partially developed state of the work. Almost the whole of the water has been used for supplying public and private tanks. Of the former class a large number has been constructed, at a cost of several thousand pounds, by the shires of Echuca and Waranga; and these tanks have been fitted with water-lifts of various forms, as well as with troughs for the supply of stock, and pipes and shoots for filling water-carts. The results effected by the work throughout this Trust District are best described in the words of Mr. Walter Scott Murray, C.E., Engineer to the Trust, who has very kindly supplied a large amount of valuable information regarding them. Mr. Murray, on 11th March of the present year, writes as follows:—"Every summer since the country has been settled the selectors have had to depend upon the public tanks and wells, and often they have been compelled to abandon their homes for several months in the summer, and camp with their families and stock on the Goulburn. This now is done, and, except in a few instances which will soon be attended to, no man in the worst season will have more than 2 or 3 miles at the very outside to travel to obtain a splendid supply of water. Of course being in such close proximity as that to the channel it may be readily imagined that the cost of constructing small supply channels by the farmers to fill their dams is very trifling. In one instance, near Corop, there is a training stable, the proprietor of which spent last year £75, and the year before £120, in carting water. This year his dam went dry, and at an outlay of about £7 he conveyed water from our main channel to his dam twice, the distance being 1½ miles. The effect of the construction of the work has been to raise the value of the land throughout the whole district by an average of £1 per acre. Where farms are in close proximity—say 1 mile—to a channel, the value has been raised by £2 to £3. Where channels intersect farms, land that would once bring £3 per acre, has sold recently

recently as high as £7." These results are all the more surprising when it is considered that the works are in an incomplete state, and that in fact they constitute a comparatively small portion of by far the finest irrigation scheme which has yet been matured in these Colonies. This project includes the construction of a weir across the Goulburn at a short distance from the present pumping station near Murchison, and of a main canal capable of carrying 68,500 cubic feet per minute. The plan (*vide* Appendix) showing the various channels now in existence, or under construction, affords a good idea of the general arrangements of the branches and distribution channels of the proposed project. Although the present supply is obtained entirely by pumping, and is used so far for stock and domestic purposes only, the ultimate object of the great project is kept in view as far as possible, so that the present channels will in nearly every case be utilized when the project is carried out. One point not indicated in the plan is the important part which the Waranga Basin will play in storing water for summer irrigation. In the preparation of the project, Messrs. Gordon and Black estimated that, of the total discharge of 68,500 cubic feet per minute which they proposed to provide for, 17,500 cubic feet per minute would be required to fill the Waranga Basin, leaving a balance of 51,000 cubic feet per minute for winter irrigation. The Warranga Basin is a large shallow depression similar in general characteristics to many of the so-called "lakes" of this Colony. Its area is about 7,000 acres, and its total available capacity 4,381 millions of cubic feet, or about 27,381 millions of gallons. It is estimated that the supply thus stored in the winter months will be sufficient to irrigate about 39,000 acres of summer crops. This added to 30,000 acres irrigated by the summer supply from the river gives a total of 69,000 acres as the estimated extent of summer irrigation. In winter the supply of 51,000 cubic feet per minute which will remain after allowing for the filling of the Waranga Basin will, according to the estimate of Messrs. Gordon and Black, suffice for the irrigation of 204,000 acres.

In describing the conditions and functions of the present water supply from the Goulburn, it has been mentioned that the channels are, as a rule, laid out with the ultimate view to their being utilized as irrigation distributaries, and that they are therefore, with one exception, artificial. In the case of the Wanalta Creek, where the natural channel has been utilized to a considerable extent several important results have been accomplished. In the first place, with the aid partly of a regulating weir and partly of a supply from the main channel of the present works, a permanent supply is secured for all land within easy distance of the creek. In the second place, by deepening the creek or making a new channel the extensive flats on its lower reaches, which were formerly inundated by floods, are now drained, and the land thus improved made available for constant use. In the third place, by the same arrangements the natural drainage carried by the creek, and which formerly caused much mischief without affording much benefit, is now distributed and stored for use during dry periods. The weir and regulator in the Wanalta Creek has been in every way a most successful work. The main channel from the pumping station on the Goulburn conducts a supply into the creek above the weir, and is continued on the opposite side of the creek. The water in the latter is held back by the weir to a distance of about 6 miles, and regulating sluices in the weir provide a regular supply along the lower portions of the creek. In the design of the weir Mr. Stuart Murray, judging by the data then available, estimated that the highest floods would not give a depth of more than 2 feet over its crest; but on one occasion since its erection 25 inches has passed over, this being equal to a discharge of about 250,000 cubic feet per minute. That the weir, which is constructed of timber obtained in the neighbourhood, stood this test without any damage whatever speaks highly for both its design and construction.

These facts regarding the Wanalta Creek have peculiar significance when compared with conditions existing in New South Wales. It is beyond question that the most common type of creek throughout the west of this Colony is that which is intermittent, and the supply in which is lost in swamps or other tracts of low land. Instances of this type naturally vary greatly in size and importance—the Narran and the Paroo being striking examples of the largest class. In the case of the Wanalta Creek the natural drainage is supplemented from the Goulburn. A similar arrangement could be carried out in connection with any of our large rivers, and where only the intermittent rivers or creeks are found, the absence of a permanent stream could be compensated for by the provision of tanks and dams of increased capacity.

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The information acquired, and the experience gained, in connection with the construction and management of the works for the water supply of Melbourne, are of great value, not merely for the guidance of other cities, but on account of the light which they throw on the general question of the utilization of water. A circumstance which lends additional interest to these works is that a portion of the supply is carried across the Main Dividing Range, thus affording in a double sense a precedent for the diversion of the Snowy River in this Colony, as suggested by Mr. Adams, the Surveyor General.

The catchment area on which the present supply of Melbourne depends is about 53,000 acres, of which extent 40,000 acres is on the southern slopes of the Plenty Ranges and 13,000 acres on the northern. The great proportion of the catchment area is of a very favourable description for impounding a supply, the central mass and northern spurs of the range being granite, while the flanks of the range are chiefly of schistose rocks. The great depth of permeable surface soil ensures the preservation of a large proportion of the rainfall and its steady flow to lower levels, while the granite and schistose rock prevent any loss of the natural supply by underground percolation. The proposed extension of the works, by impounding a supply from Watts River and from Graceburn and Corranderk Creek, will enlarge the catchment area by about 45,000 acres, making altogether a catchment of 98,000 acres, or considerably less than half the area on which the new Sydney Water Supply Works will depend. The catchment of the Watts River is porphyritic country, with spongy soil and springs in all directions.

The storage reservoir at Yan Yean, about 20 miles from Melbourne, has a total capacity of 6,400 millions of gallons, and an available capacity of 5,300 millions of gallons. The corresponding figures for the Prospect Reservoir for the supply of Sydney are 10,635 millions and 7,110 millions. In connection with the Watts River Scheme, Mr. W. Davidson, Superintending Engineer in charge of the Yan Yean Works, has proposed that a second storage reservoir should be constructed; and though no steps have been taken to carry out this project, there is little doubt that the question will have to be considered within the next few years. Mr. Davidson has found a site at which, with a masonry dam 105 feet in height, and 11 chains in length on the crest, the storage capacity in the upper 25 feet of the reservoir will be 2,000 millions of gallons. A general plan of the works is given in the Appendix, but, in addition, the following figures, kindly supplied by Mr. Davidson, will be of interest:—

Present Works.

	Miles.
Open channel	19
„ in course of construction	10
Mains, not including city mains	70
„ 30", in course of manufacture	6½

Proposed Extensions.

Open channel	31
Piping, inverted syphons	6½
Tunnels	8

The discharging capacity of the channels in the present works is as follows:—

	Million gallons per diem.
Silver Creek channel—in course of construction	12
Wallaby Creek channel	30
Clear Water channel	120
Yan Yean—Morang channel	34

The proposed Watts River canal and tunnels will be excavated to such dimensions as will deliver a supply of 56 million gallons per diem; but lining of channels wherever necessary will be put in for a supply of 25 million gallons only, and the syphons will also be designed to discharge at this rate. On the whole, Mr. Davidson estimates that the supply from Watts River, together with that obtainable from various creeks, would amount to 100 million gallons per diem, and this altogether in addition to the supply available from the present works.

Under present circumstances the Yan Yean mains will deliver 33 million gallons per diem, which is 7 millions more than the greatest demand for one day which they have yet had to sustain.

The experience gained on the Yan Yean works has furnished a valuable contribution to the knowledge of the relative values of open channels and iron pipes. Some time ago there was an urgent demand for an increased supply; and in order to meet

meet this demand with the least possible delay it was decided to take up some miles of main, substitute an open channel of much greater discharging capacity, and use the pipes thus made available in duplicating the line lower down. This method of increasing the supply was promptly adopted, and not only did it prove highly economical, but in addition the quality of the water was perceptibly improved.

Although the visit of Mr. Deakin to America had special reference to irrigation, one of the most striking results of his report has been a saving of about £27,000 on one contract in connection with the Melbourne Water Supply. Mr. Deakin, in his report, called prominent attention to the extensive use of wrought iron instead of cast iron for pipes in Western America, and to the undoubted advantages of this practice. On account of this, when a contract for the supply of iron pipes for the Yan Yean Supply had to be let, soon after the issue of the report, it was decided to call for tenders for pipes of wrought iron. The result was that, instead of an outlay of about £62,000 being required for cast iron pipes of the usual description, the contract was let for £35,000 for wrought iron pipes of the same discharging capacity. Considering that wrought iron pipes of equal strength are much lighter than those of cast iron—that they are much cheaper for the same discharging capacity—that there is no risk of fracture, and that a broken pipe is easily repaired—it seems surprising that wrought iron pipes have not been more generally adopted. In the Appendix will be found the specification for the wrought iron pipes which are to be used on the Yan Yean Works. That portion of the specification regarding the preservation of the pipes by the use of a mixture of tar and asphaltum is worthy of attention, as this is a point to which Mr. Davidson, the Superintending Engineer, has devoted much care and attention.

The works connected with the Melbourne Water Supply are of the most substantial character throughout. Masonry and pitching of granite, set in cement, constitute the lining generally adopted in the channels. The various cross sections of the channels, as well as the rate of fall, are given in the Appendix. In the case of the section in "wet granite detritus," on the Silver Creek Conduit, the style of the cross-section and the material used were adopted as the most economical under the contract rates. One of the most remarkable of the works for the supply of Melbourne is the 51 feet drop on the Clear Water channel. Chiefly on the ground of economy, the difficulty occasioned by a sudden fall on the line of conduit is surmounted by laying a 30-inch main 7 chains in length, and with a fall of 51 feet. The entire supply for Melbourne passes through this 30-inch main, and while as a spectacle the effect is impressive, the waste of so much water power seems out of keeping with Victorian enterprise.

The Coliban Water Supply scheme was designed to meet the domestic and mining requirements of several important towns, as well as of a number of mining townships scattered over a large extent of country. The supply is obtained from the Coliban River, which rises in the Main Dividing Range and flows into the Campaspe. The storage reservoir is situated near Malmesbury, in the valley of the Coliban, and is capable of containing about 3,000 million gallons. Mr. C. W. Langtree, Secretary for Mines and Water Supply in Victoria, has very kindly supplied, among other information, a general plan of the scheme, a table giving interesting details regarding the various reservoirs, &c., and a "Statement of the Rules and Regulations of the Castlemaine and Sandhurst Water Supply District." These papers *(vide* Appendix) afford such complete information regarding the Coliban scheme and its working that little explanation is required in addition. The main channel from Malmesbury to Sandhurst is 42½ miles in length, and there are, in addition, 165 miles of distributing and sluicing races. For the first 18 miles from Malmesbury the main channel has a bed-width of 5 feet, a depth of 5 feet, side-slopes of 1 to 1, and a fall of 3½ feet per mile. For the remaining distance to Sandhurst it has a depth of 4 feet and a fall at the rate of 5 feet per mile, the other conditions remaining the same as in the first length. The distributing and sluicing races vary from 3 to 6 square feet in sectional area, and have falls ranging from 4 to 6 feet per mile. There is a series of drops along the line from the main channel, which would yield altogether 403-horse power, but no use has yet been made of this power for manufacturing or other purposes.

Although Sandhurst depends almost entirely on the Coliban scheme for its water supply, a considerable quantity of water is impounded in the Crusoe and Big Hill reservoirs from the catchment areas above them. Regarding these reservoirs

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and their drainage areas Mr. C. W. Langtree writes as follows:—"The drainage areas proper of the Big Hill and Crusoe reservoirs are limited in extent, and their surfaces have to a large extent been broken up by mining operations; the effect of which is that the water collected therefrom is charged with large quantities of clayey matter, which can only be got rid of by lime treatment. For this purpose lime settling and clear-water ponds are included in the appendages of both reservoirs. The rainfall over Big Hill Reservoir watershed is conveyed by an intercepting channel clear of the reservoir, in order that the comparative purity of the Coliban water stored therein may be maintained, and thus obviate the necessity of the lime treatment."

The Coliban Works furnish an instance of the supply of a series of towns and mining settlements from one comprehensive scheme. Although the direct net return from these works is only about $1\frac{1}{5}$ per cent., the benefits conferred by the scheme have been enormous; in fact, without the Coliban scheme, the present advanced state of development of the mining and other industries throughout the Sandhurst and Castlemaine districts would have been impossible. Although the works must still be considered as only partially developed, it is a question whether, even in their present state, they would not have afforded a fair direct return if the mistakes which occurred in the course of their construction had been avoided. It is believed that by the construction of a dam about 95 feet in height, at a distance of 8 miles above that at Malmesbury, 10,000 million gallons of water can be stored; and, if this work be carried out, not only will additional security be afforded to Sandhurst and Castlemaine, but it is probable that, after ample allowance for domestic mining, and manufacturing purposes, a supply will be available for irrigation on a small scale. This Upper Coliban Reservoir, if it can be constructed at a moderate cost, should greatly improve the financial position of the entire scheme.

In our previous Report we drew the attention of your Excellency to the steps which have been taken by the Government and public bodies of Victoria for the conservation of water in that Colony; and now that we have had an opportunity of personally inspecting several of the principal works for the conservation and distribution of water in their arid northern areas, we are more than ever convinced of the wisdom of the course upon which our neighbours have entered, and of its thorough adaptability to meet many of the requirements of our own territory. Upwards of half a million sterling has been expended, with the result that extensive tracts have been again brought into profitable use which had been rendered desolate and uninhabitable from the want of water, and wherever irrigation has been attempted it has been followed by the most satisfactory results. Much as has been accomplished, however, in Victoria, the Government and people of that Colony are not by any means disposed to be satisfied with the amount of success which has been attained, but they recognize more fully than before that the prosperity and increase of population must depend in a very large measure upon the means which they adopt for the conservation and utilization of the rainfall. They are preparing to bend all their efforts to the accomplishment of this object to the fullest extent practicable; and if it should turn out that the anticipations of their Government are realized, namely, that it is possible to irrigate a million acres of land in Victoria, the increased productiveness of the soil under that condition of cultivation will, we anticipate, be equivalent to increasing the present productiveness of her territory to the extent of at least twenty millions of acres.

We have been very favourably impressed by the provision which has been so generally made throughout Victoria for the supply of water to towns. While large cities, such as Bathurst, Goulburn, Maitland, and Newcastle, have been for many years without a water supply, we observe that many of the small, and, by comparison of numbers with old established communities in New South Wales, insignificant towns, were provided with an abundant supply of good water; and we could not but regret that so much remains to be done to overtake the wants of our urban population in this respect. It is hardly conceivable that in any part of the globe the natural conditions of life can be more favourable to health than in the salubrious climate of this Colony; and yet, owing as we believe to neglect in providing a supply of pure water, both in the towns and in the rural districts, typhoid fever and other diseases have increased to an abnormal and an alarming extent. There are scores of towns in New South Wales which could be supplied with water, at a cost the interest of which could be easily borne by the inhabitants; indeed, the strong probability

probability is that an amount larger than would be sufficient under a water rate is now paid for carting water from sources where no precautions are taken to guard against pollution. Along the banks of the Hawkesbury, the Hunter, and other rivers, there are groups of towns which, there is good reason to believe, might be supplied with water from works designed to meet the requirements for stock and irrigation of the districts in which they are situated; and we anticipate that it will be found expedient and economical to provide for the requirements of towns in the systems of water supply which may be devised for the benefit of the rural population. The greater progress which has been made in this direction in Victoria is no doubt attributable to the system of local government which has so long obtained in that Colony; but it may be expected that similar results will follow here, when the Legislature shall have made legal provision under which the intelligence and wealth of the country can be organized for purposes of self-help, and shall have impressed upon the inhabitants of particular districts the obligation to make the local improvements which they desire to obtain.

We have the honor to be,
Your Excellency's most obedient servants,

(SIGNED) WILLIAM JOHN LYNE, PRESIDENT.
RUSS. BARTON, VICE-PRESIDENT.
JOHN B. DONKIN.
F. A. FRANKLIN, C.E.
D. M'MORDIE, B.E., M. INST. C.E.
R. L. MURRAY.
GEO. W. TOWNSEND.
WALTER S. TARGETT.
HARRY GILLIAT.

CHAS. ROBINSON, Secretary,
Sydney, 23rd June, 1886.

I agree generally with this Report, with exception of the last paragraph of page 12, stating that the experience gained on the Yan Yean Works has furnished a valuable contribution to the knowledge of the relative value of open channels and iron pipes.

(Signed) FREDK. B. GIPPS, C.E.

APPENDIX TO THE SECOND REPORT OF THE COMMISSIONERS.

ROYAL COMMISSION—CONSERVATION OF WATER.

REPORT ON THE GUNBOWER AND OTHER WORKS, BY THE ENGINEER TO THE COMMISSION.

IN pursuance of the instructions of the Commission to visit and report on such important Victorian works as the Members of the Commission had not an opportunity of examining, I proceeded to the Gunbower District, to ascertain the extent to which irrigation is carried on, the methods adopted, and the degree of success attained.

It may be explained at the outset that the Murray is the source from which the water is obtained for irrigation throughout this part of Victoria, although it is intended to utilize in the Swan Hill Trust District any supply of water which can be spared from the Loddon and Campaspe schemes. In some cases the supply is pumped direct from that river, but as a rule it is obtained from the flood-water which overflows from it and becomes stored in the Gunbower and other creeks, and in such depressions as Kow Swamp. The distribution of the flood-water is doubly aided by the configuration of the country. While the general fall of the district is at an average rate of about 9 inches per mile and in the direction of the Murray, there is also a fall in the ground to a moderate distance at right angles with the river bank.

The Gunbower, like the Tuppal and other creeks on the New South Wales side of the Murray, is small in section at the offtake from the river, and, like them, becomes greatly enlarged in section as the distance from the river increases. Although at and near the head it has been deepened, and its sides dressed off roughly to slopes of about 1½ to 1, still its bed width at this part does not average more than 7 feet, while its depth varies from 10 feet down to about 3 feet. The course of the Gunbower Creek too is very tortuous, so that altogether considered as a distributary, the portion near the head is inferior to the Yanko Creek. The former, however, increases greatly in section, so that at a distance of about 3 miles from the head it is from 50 to 60 feet wide, and from 6 to 9 feet deep. At intervals on the creek there are broad and deep lagoons, the supply in which remains so uniform as to suggest the idea that a portion of it is due to percolation. At one of these lagoons is erected the pumping machinery which raises water for irrigation on the Gunbower Station of Messrs. Booth & Co. As the Tuppal Creek derives a supply from several places many miles downstream from its head before any water flows in at the head itself, so the Gunbower Creek derives a supply first from Deep Creek and next from Bagot's Creek, and from the creek head only in unusually high floods. It is reckoned that the flood-water requires to be flowing from the Murray with a depth of 6 feet in Deep Creek and of 4 feet in Bagot's Creek before any can pass in at the head of the Gunbower. Of these outlets, Deep Creek has been dressed off to a section 10 feet wide at the bottom, and with side slopes of 1 to 1. The bed at the offtake from the Murray is 12 feet below the level of the flood of 17th December, 1884, and the rate of fall in the

channel is 1 foot 4 inches per mile. The length of the improved part is about 3¼ miles, but the creek is further improved by making straight cuts across bends and putting in a stop-gate. The amount already spent in improving Deep Creek is about £600, with the result that the flood-water now flows into it when the gauge at Echuca reads 6 ft. 6 in. above what is there termed "summer level." Bagot's Creek also has been improved, the bed width having been made 12 feet, and the side slopes 1½ to 1. In ordinary high floods the outflow from the Murray through it will be 7 feet in depth. The fall in the first 3¾ miles is at the rate of 2 feet per mile; but beyond that distance, towards Kow Swamp the fall ceases, and parts of the creek bed are so high that the effective fall in a length of 6 miles is under 5 feet. In addition to the Gunbower Creek head, which has already been described, and the two important outlets above mentioned, a new outlet is proposed, with a bed width of 10 feet, side slopes of 1 to 1, and a fall of 9 inches per mile. The depth of water in this cut at ordinary high floods will be slightly over 9 feet. The length of cutting to be done in this case is 2 miles 3 chains.

The quantity of water diverted from the river Murray by existing works, or proposed to be diverted by works which have been designed, is a matter of great importance. It would appear that during an ordinary flood the outflow in Deep Creek is 9 feet in depth; in Bagot's Creek 7 feet, and at the head of Gunbower Creek 3 feet. The depth at corresponding periods in the proposed new cut will be 9 feet. Making allowance for the rough state of the present outlets, and including the quantity which the new cut will carry, I believe that on a fair estimate the total supply which will thus be diverted in an ordinary flood will not fall short of 1,000 cubic feet per second, and the discharge of the outlets can be increased by keeping them in good order.

In the course of my inspection of the irrigation operations in the Gunbower District, three subjects in particular claimed my attention: 1st, the description of machinery used for raising the water; 2nd, the methods adopted for laying out and constructing distributaries; and 3rd, the agricultural operations and the general management of the irrigation.

The small lifts which are obtainable throughout a great portion of the Gunbower District are favourable to the use of centrifugal pumps, which are here invariably used for irrigation purposes. As an example of irrigating plant of a high order, that at the Gunbower Station demands special mention. There is a compound condensing engine of 40 horse-power nominal, by Robison Brothers of Melbourne. This engine works an 18-inch centrifugal pump by the same makers. The suction-pipe, which has no foot-valve, is tapered out to 22 inches in diameter at the bottom. This machinery furnishes the main supply for irrigation, but in addition to it, two portable engines, one of 10 and the other of 12-horse power, are occasionally used to irrigate isolated patches of land whenever required. The machinery used by Mr. G. R. Hayes, of Bandon Park, Torumberry, for the irrigation of his land, is about equal in power with that at the Gunbower Station. Mr. Hayes' engine, which is also of 40-horse power nominal, is fixed on the bank of the Murray, and the pump well is connected with the river by a timbered drive—6 feet by 5 feet. The well, which goes down to the level of the river bed, is 14 feet by 7 feet, and is intended for two 18-inch centrifugal pumps, but only one has actually been used. Mr. John Garden, J.P., of Cohuna, who was the first to call public attention to actual proofs of the benefits of irrigation in northern Victoria (see Melbourne *Argus* of 11 November, 1882), uses a 10-horse power engine and a 15-inch centrifugal pump, and irrigates from 300 to 400 acres of cereals, and about double that area of grass land. It is necessary to state, however, that in his case the lift is only about 5 feet. Mr. W. J. W. Patchell, of Kerang, who has practised irrigation since 1863, used an ordinary Californian pump for the first two seasons, and after that a McComas water-lifter, but he adopted the centrifugal pump nearly twenty years ago, and has made use of it ever since then.

In connection with this question of pumping machinery, I may mention that when I was in Echuca Mr. Whitehead, mechanical engineer of that place, very kindly showed me the plans of a barge built by him, and on which he had erected pumping machinery for use on the Murrumbidgee, at Mr. Fitzwilliam Wentworth's Burrabogie Station. This pumping machinery consists of one of Messrs. J. and H. Gwynne's "Invincible" patent compound direct-acting centrifugal pumping engines, and is capable of raising from 4,000 to 5,000 gallons per minute to a height of 40 feet.

feet. The intention is to provide for the raising of a supply of water for irrigation or for stock purposes at any place it may be required along the river frontage. Both the machinery and the barge have been tested by use, and have shown that they satisfactorily fulfil the conditions required of them. I was informed that the arrangement adopted by Mr. Wentworth on the Murrumbidgee is to be followed in at least one case on the Murray, near Echuca, and that a barge has been constructed, and pumping machinery ordered, for this purpose.

When irrigating by means of a centrifugal pump, the rush of water near the outlet of the delivery pipe necessitates precautions for the protection of the channel near that place. The general course adopted is to deliver the water into a timber shoot, and to give the distribution channel an enlarged section at and near this shoot.

The subject of the distribution of water for irrigation is one in regard to which great advances have been made in Victoria, and, in some cases at least, the improved system followed is the result of dearly-bought experience. A point which is particularly worthy of note is the fact that on every holding where any considerable area is under irrigation, cross sections of the land irrigated or intended to be irrigated have been taken, at such intervals as to enable the occupier to align his distributaries in a suitable and scientific manner. At first irrigators believed that such leveling was unnecessary, but they soon found that this opinion led to expensive mistakes. In the property of Mr. Hayes, at Torumberry, there is one main distributary $2\frac{1}{2}$ miles in length, and from it about 12 miles of laterals or branch channels. The main distributary is about 10 feet wide at the bed, 25 feet at the ground level, and about 40 feet between the tops of the banks. For the irrigation of cereals the laterals are in this case made at intervals of 100 yards, and each lateral is intended to irrigate 25 acres; but for the irrigation of the native grasses the intervals between the laterals are much greater. The outlets from the main channel to the laterals consist of hollow logs laid through the channel banks. The intake end of each log is kept closed with boards except when water is required. The system followed in carrying out irrigation is to pump up a sufficient supply to fill the main channel to a height of from 1 to 3 feet above the ground level, and then to open the outlets in succession as the flooding of the land proceeds. A somewhat similar system is followed on the Gunbower Station, but in other cases the flooding is done direct from the main distributaries without the intervention of laterals. Excepting in the case of grass land, this arrangement is too wasteful to be long persisted in. On this point it is necessary to refer to a statement made in Mr. Derry's Report to the Victorian Water Commission. On page 43 of that report Mr. James, an American irrigation engineer, is represented as stating that irrigation from "branch drains" instead of from larger distributaries "would require six times the labour, and consume twice as much water, and be of no advantage to the crop." This statement is probably correct as applied to the particular case to which it referred, but it is altogether at variance with the results of ordinary experience. In the case referred to by Mr. James, the "contour checks" or divisions of the land are about 20 acres each in area, and the distributaries are taken off the main canal at uniform intervals of a quarter of a mile. While this system is probably suitable under certain circumstances, the statement that irrigation conducted by flooding from laterals would require six times as much labour is certainly an exaggeration, and the other two statements, namely, that twice as much water would be required, and that there would be no advantge to the crop, are exactly the reverse of general experience. So well has it been established that the division of fields into small compartments is productive of economy in the use of water, that in some at least of the provinces of India, the size of the "kiyari," as an irrigation compartment of a field is termed, is limited by special regulations sanctioned by Government. The most recent investigations tend to show that under ordinary circumstances about one-eighth to one-tenth of an acre is the best area for a "kiyari" so far as economy of water is concerned. The conclusion that small divisions of the land give the best results with the lowest supply of water has been arrived at wherever irrigation has been long practised, and a good instance of this can be found in Victoria. Mr. Patchell, of Kerang, whose experience of irrigation, as already mentioned, extends over twenty years, has found by actual observations on his own land that a considerably smaller supply of water will suffice when the land is divided into small compartments, and that, in addition, the crops are much more even in their growth. It must, however, be understood that while in the case of ground which has been

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broken up the saving in water effected by the use of small compartments is very important, it is different with grass land, where the soil is compact and unbroken. In irrigation under the latter circumstances, the loss of water caused by flooding large areas of fairly level land is so slight that it would not be worth the trouble to portion off the land into "checks" of small or even moderate dimensions.

The excavation of main distributaries is done with the plough and scoop, and that of the laterals with the ordinary plough and the V plough. One scoop which I measured, and which I was informed is about the most common size in use, was 2 feet 10 inches wide by 3 feet 2 inches long, and removed about one-third of a cubic yard at a time. Scoops of this description were, at the time of my visit, being used on a contract for the excavation of 7 miles of channel for the Wimmera United Waterworks Trust near Murtoa. This channel was to be 4 feet in width at the bottom, and to have side slopes of 1 to 1. The depth of cutting throughout 5 miles of the contract was only from 2 feet to 4 feet, but, in the remaining 2 miles it ranged from 5 feet to 9 feet. No part of the spoil bank was to be within 3 feet of the edge of the cutting. Considering that the wages of a labourer at Murtoa range from 8s. to 9s. per day, the contract rate of 9d. per cubic yard for the excavation of this channel, including the dressing of the slopes, appears very moderate. That the dressing of 1 to 1 slopes merely by expert use of the scoop can be done with neatness and uniformity is a fact of which I had ample evidence, both in the Wimmera and the Echuca and Waranga Trusts. The main distributaries excavated by private individuals for irrigation purposes are made with the same class of implements as are used by the Trusts, but the work is done in a much inferior style. This appears to be partly due to a mistaken idea that an improved style of distributary would mean useless expense. In reality, the roughly constructed distributaries, with side slopes of 2 or 3 to 1, or even flatter, are far more expensive in the end than those which are made scientifically at a slightly greater first cost. This is easily understood when the following facts are borne in mind:—(1) That a distributary is frequently empty for some time, and that every time it is supplied great loss of water occurs by absorption in the bed and banks; (2) that the loss by absorption is in proportion to the wetted area; and (3) that the land occupied by a distributary is lost for agricultural purposes. Thus, in the case of a distributary whose top width is 33 feet, while it ought to be only $16\frac{1}{2}$ feet—and I have seen cases quite as bad as this—there is a loss of 2 acres of land for every mile of distributary, in addition to the increased loss of water by absorption and evaporation. Although the subject of the distribution of water in the country districts in Victoria is still in its infancy, rapid advances are being made in regard to it. The principle of designing channels so that the water will have the maximum velocity which the soil will satisfactorily bear is now being adopted in works carried out by the Trusts. In the Echuca and Waranga Trust District, this velocity is considered to be about 140 feet per minute. Following out this principle, what appear at first sight as very rapid rates of fall for channels excavated in earth have in some cases been adopted, in the Wimmera Trust District, by Mr. A. G. Brown, the Trust Engineer. In one case a channel having a bed width of 3 feet has a fall of 7 feet per mile, and in another case a channel of 6 feet bed width has a fall of 9 feet per mile. No scouring has taken place in either channel, which is only natural when it is considered that the depth of water flowing in them is only from 12 to 18 inches. Taking a depth of one foot for the larger channel and 18 inches for the smaller, it is found that the respective velocities are only 1·60 feet per second and 1·63 feet per second. It is evident from these figures that if the depths of water do not exceed those assumed, the Engineer might safely have adopted even greater rates of fall.

In the particular instance of American irrigation already referred to, it is mentioned that the distributaries are taken off the main canal at uniform intervals of a quarter of a mile. This arrangement is one which could not be imitated with advantage except under most unusual circumstances. The main watershed and valley lines which constitute the leading natural features of a country have their subordinate or branch ridge and valley lines, and these again are divided in the same manner. These natural features become less distinct as the land becomes flatter, and also as the rainfall diminishes; but still they exist, and they can and should be found in all projects for irrigation. It should not be necessary to point out that Nature does not make ridge and valley lines at regular intervals, yet the construction of irrigation distributaries at equal intervals practically ignores this truism. In the early days

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of scientific irrigation in India, when an oversight of this description was perhaps to some extent excusable, distributaries were in some instances aligned without sufficient investigation as to the position of contours. The result was that such distributaries were, by comparison, both expensive and ineffective, and that in some instances new distributaries on more advantageous lines had to be constructed in their stead. The accompanying sketch plan (see Appendix) shows a portion of the Etawah Branch of the Ganges Canal, with some of the old distributaries and the new ones proposed to take their places. The contour lines show at a glance the necessity for the proposed alteration.

As already mentioned, the laterals are excavated by means of the ordinary plough and the V plough. The former breaks up the surface of the ground, and the latter following it pushes the displaced earth aside to make up a bank for the channel. With a pair of ploughs—one of each kind—2 miles of laterals can be made in one working day. The V plough as commonly used is of the simplest description, capable of being made on any farm, and modelled after the sketches given in Mr. Derry's Report to the Victorian Water Commission. One which I measured consisted essentially of two hardwood planks set on edge and bevelled off and bolted together at the apex, the one being 15 feet long and 9 inches by 5 inches in section, and the other 10 feet long and 15 inches by 2 inches in section. These two, besides being joined at the apex, were provided with a distance bar. The point of draught was on the longer timber, and the draught chain passed through a guide ring at the front of the plough. When at work, the longer beam follows the track of the ordinary plough and presses against the exposed face of the solid ground, the resistance of which enables the short side of the V to push out so much of the soil as has been already displaced.

In some cases, and particularly that of Mr. Hayes's property already referred to, the laterals have been made with considerable care, and with the intention of maintaining them permanently. In the Gunbower Station, where about 10 miles of main distributaries have been constructed, it is intended that the laterals should be regarded as purely temporary, and they will therefore be levelled and ploughed over if necessary or convenient at every change of crop. As the one important objection to the use of numerous laterals lies in the fact that they are serious obstacles to the effective use of agricultural machinery, this course decided on at the Gunbower Station must be looked on as a very interesting experiment. If successful—and there is little reason to doubt of its success—economy in water can be ensured by making laterals at short intervals, while the effective use of reaping machinery will not be interfered with, as the laterals can be levelled when the last watering is given to a crop.

The preservation of the slopes and banks of distributaries, by encouraging the growth of grasses on them, is one which has not been altogether overlooked in Victoria. On the Gunbower Station an experimental sowing of lucerne has been made on the banks of parts of the distributaries, and the result has been so satisfactory that the practice will be extended. The necessity for bearing in mind that the seeds of plants can be easily disseminated in the process of irrigation was strikingly exemplified on one property which I visited. In this case, Bathurst burrs were to be seen growing at intervals along the margin of the main distributary and the laterals, while no burrs were to be seen elsewhere in that neighbourhood. The manifest explanation of this was that the burrs had floated down the Murray and found their way into the pump well, from which they had been raised into the main distributary.

The chief benefit to be derived from a study of irrigation works in America and Victoria arises from the evidence they afford that by the adoption of machinery and of labour-saving appliances to the utmost extent possible, both in the construction of the works and in the subsequent agricultural operations, not only can irrigation works be made remunerative, but agriculture can be placed in a position to compete successfully with countries where an inferior class of labour is abundant and cheap. It would be difficult to overestimate the importance of the lessons thus taught by the irrigation works of America, and in a less degree by those of Victoria, and any incorrect inferences drawn from these works are therefore likely to be all the more mischievous. It will be on the whole a safe rule to assume that if we wish to know how to construct irrigation works cheaply, with such labour as we have available in New South Wales, excellent examples for our guidance are to be found in America,

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and to some extent in Victoria; but if we require information as to the general alignment of canals, or the economical use of our water supply, or the principles of management and administration of irrigation works, we must look for guidance to the experience of India, Italy, Spain, and France.

As a general rule, the financial results of irrigation wherever practised in Victoria have been, so far, highly satisfactory. Among cereals, wheat is the crop most extensively irrigated, and the conclusion arrived at is, that with irrigation a good crop is a certainty, while, without irrigation, not only is a first-class crop rarely obtained but even a moderate crop can be had only in good seasons. Several of the wheat-growers in the Swan Hill Trust district informed me that as an average they could not depend on obtaining a crop of more than 10 bushels to an acre without watering, and that they could rely on having at least 20 bushels with watering. This statement does not agree with the figures for 1885 given in the Victorian Year Book, by Mr. Hayter, as the average produce of an acre of irrigated wheat is there given as only 10·64 bushels; but it has to be remembered that the compilation of statistics regarding irrigation has only commenced in Victoria, and that the returns did not take any account of what constituted "irrigation," so that land hastily and perhaps only partially flooded at a period too late to save the crop would be reckoned as irrigated. One thing is certain in this matter, namely, that if the farmers of the Gunbower district had obtained only 10·64 bushels of wheat per acre on an average from irrigated land, they would have been much less enthusiastic regarding the results of irrigation. The statistics of the past season, which are now being prepared, will no doubt throw much more light on the matter; but meanwhile it may be mentioned that the return for 1885 shows that, as compared with land not artificially watered, irrigated land gave twice the yield of oats and barley, about four times the yield of mangel-wurzel, more than three times the yield of hay, and about twice the yield of potatoes.

The question has been raised whether these Colonies can hope to compete in the production of cereals with other countries where labour is much less expensive. With reference to this, it should be remembered that no other portion of the population of a long settled country is so conservative as that engaged in agriculture. In India, which is rapidly approaching the first place as a wheat-exporting country, there has been, so far as can be ascertained, scarcely any improvement in agricultural appliances during the last 2,000 years. The immense increase in the export of wheat from that country is not in the slightest degree due to any improvement in the system of agriculture, but is the direct result of the construction of canals and railways by the Indian Government. In an elaborate report, prepared for the Government of the North-west Provinces and Oudh, on agriculture in the Cawnpore district, it is stated that in the case of a crop of wheat of about 16 bushels to an acre, twelve men will be required to reap 1 acre in a day, four oxen will take six days to tread out the grain, and four men will take a day to winnow it. When we compare this with the fact that a good reaper and binder, requiring only two men for its working, will reap 10 acres in a day of twelve hours, and that the appliances for the preparation of the ground are also immeasurably superior to those used in India, it is not difficult to understand how the higher cost of labour is compensated for by labour-saving appliances. The stripper, as well as the reaper and binder, is extensively employed in Victoria, and I was informed that the combined stripper and winnower is steadily coming into use. With one shift of three horses a stripper will reap the grain off from 8 to 10 acres in a day. As even the filling of the wheat into bags is done by a mechanical appliance, it may be reckoned that the produce of about 10 acres can be not only reaped but prepared for the market in one day by the combined use of a stripper, winnower, and bag-filler. Mr. John Garden, who has already been referred to in this report, and who has a holding of about 2,300 acres on the Barr Creek, at a distance of 18 miles from Kerang, afforded me some useful information on the subject of the labour required to manage irrigation. In reply to the question—"Supposing a man had 2,560 acres of land, 300 acres of which was under irrigated grain crops, 700 acres under irrigated grass, and the remaining 1,560 acres unirrigated, would that man, with the help of three others, manage his farm?" Mr. Garden said—"Certainly, if the three men assisting had an interest in the farm; as for instance, if they were sons of the owner. I should mention that this question was put after Mr. Garden had informed me of the labour employed by himself, the proportion being similar to that

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in the case of his farm. In the latter, when the irrigation of 375 acres of wheat was in actual operation, the establishment employed consisted of two men to work the engine in turns, and a third to attend to the distribution of the water, that is three men altogether. During the same season, Mr. Garden irrigated about 750 acres of the native grasses, the total labour engaged in the farm being three men and one boy. So far as I could ascertain, this proportion of labour did not differ materially from that engaged on other properties where irrigation is used for similar crops. When mixed crops are grown more labour is required, and as an instance of this, Mr. Patchell, of Kerang, employs four men to attend to the management of 150 acres of such irrigation.

The relative suitability of different crops for irrigation is a subject which has received practical consideration on the Gunbower Station. The conclusion arrived at is that, under the circumstances there existing, the most advantageous crop to irrigate is lucerne, but it is intended to take one or two crops of wheat or oats off the land as it is broken up and to sow the lucerne afterwards. In the course of experiments with different crops the irrigation of prairie grass and also of cocksfoot grass was tried, but the result was not encouraging in either case, and the conclusion arrived at was that their comparative failure was due to the unsuitability of the climate. The irrigation of the native grasses also was tried on an extensive scale, as much as 2,000 acres having been flooded in one season on this station; but though the result was good, so far as increase of grass was concerned, the experiment was not deemed profitable. This conclusion is very different to that arrived at by Mr. Garden from his experience under circumstances differing but slightly from those at Gunbower. His opinion is decidedly in favour of the flooding of the native grasses. He states that the effect of a good flooding is not only very beneficial in the season during which it is given, but is also apparent in an increased growth of grass in the spring of the succeeding year. Mr. Garden also states that when he took up his selection the land would not keep one sheep to an acre, whereas now an acre of his irrigated grass land will maintain five sheep. Although, in addition to the crops mentioned, I found instances of the irrigation of maize, potatoes, fruit-trees, and vines, I did not hear of a single case in which artifical watering was considered to be otherwise than beneficial.

The cost of irrigation necessarily varies greatly, according to the distance of the source of the water supply, the height (if any) which the water has to be raised, the nature and configuration of the ground, the nature of the crop, and several other causes. Much can, however, be learned from the outlay incurred under known conditions, and from the rates which landowners have expressed their willingness to pay. In Mr. Garden's case, the cost of his engine and pump in position on the ground was £600, and his outlay in making about 7½ miles of channels amounted to about £100—that is a total capital expenditure of £700. This outlay has enabled him to irrigate from 350 to 400 acres of cereals, and about double that area of native grass. The gross expenditure was therefore equal to about 13s. for every acre irrigated; but as, roughly speaking, cereals and other crops would require twice as much water as grass land, the capital expenditure may be considered as equal to £1 per acre for land under crops and 10s. per acre for grass land. The combined cost of fuel for the engine and labour for working the engine and distributing the water is estimated by Mr. Garden to amount to only 1s. 6d. per acre on an average. The first successful application of the water was immediately followed by an increase in the value of the land, sufficient to considerably more than cover the capital outlay. In connection with the estimated cost of this irrigation, it has to be borne in mind that the lift is only about 5 feet on an average, and does not reach a maximum of more than 7 feet. In two other cases, in one of which the lift was only slightly greater than this, and in the other about double, the cost of irrigation, exclusive of interest on the plant, was estimated at 5s. per acre. In the Wimmera District the Water Works Trust has received several offers from landowners to pay from 15s. to £1 per acre per annum for sufficient water to irrigate crops.

The efficiency of the arrangements for the distribution of the water is a most important consideration when calculating the cost of irrigation. By raising a supply 6 feet from the River Loddon with an 8 horse-power engine and a 10-inch centrifugal pump, Mr. Patchell of Kerang irrigates 1 acre per hour, but has irrigated as much as 25 acres in a day. From his experience of the improvements which he has made

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in the system of distribution, he estimates that the same plant would not irrigate more than 13 acres per day if it were in the hands of a person new to irrigation, and who had not provided a suitable arrangement of distribution channels. Mr. H. Hawkins, who irrigated about 500 acres of wheat in 1883 and the same area in 1884, by raising a supply of water with a 12-inch centrifugal pump from Kow Swamp, was able to flood from 15 to 20 acres in twenty-four hours. The lift in this case was about the same as that at Kerang.

The experience of Mr. Garden has been substantially confirmed by that of Mr. Yeo, of Kerang. The latter gentleman found that after placing his engine and pump in position and constructing distributaries, the cost of irrigating his land amounted to only 2s. per acre. This included the cost of working the engine and attending to the distribution of the water.

At a recent discussion in Melbourne on a paper read by Mr. G. Gordon on "Australian and American Irrigation," that gentleman supplied some valuable information regarding the cost of pumping. On the subject of irrigating by this means he states as follows:—"I made a very careful estimate of the cost of irrigating 500 acres of lucerne, allowing 2½ inches of water once a fortnight; the pump to be worked ten hours a day for 156 working days; the water to be raised 24 feet by a centrifugal pump at the rate of 300,000 gallons an hour, sufficient for 42 acres a day, and it amounted to £197 for the season, or about 8s. per acre. This is for pumping only. The same machinery applied to irrigating cereals would cost 2s. 8d. per acre, and would irrigate 400 acres.

"I have made some estimates for large and small quantities for different heights of lifting, and the result is shown in the following table:—

No.	Quantity in cubic feet per minute.	Height of Lift.	Cost of Pumping per 1,000 cubic feet.
1	33·7	100	1·5d.
2	635	24	0·32d.
3	2,222	39½	0·83d.
4	4,600	25	0·42d.
5	9,500	6	0·19d."

These rates show what a large margin exists between the cost of supplying water by pumping under fairly favourable circumstances and the price which landholders are willing to pay for the water. For instance, in the case of the 25-feet lift, with water supplied at the rate of 0·42d. for 1,000 cubic feet, the cost of the quantity required for the irrigation of 1 acre of wheat or other cereal would be only about 1s. 6d. This strikingly illustrates the advantages of irrigation, when it is considered that experienced farmers are willing to pay from 15s. to £1 per acre for a sufficient supply of water for the irrigation of such crops, and at a much higher rate for the irrigation of fruit-trees.

While the works which have been carried out in Victoria for water conservation and supply throughout the northern part of that Colony are a credit to the enterprise and skill which they illustrate, it could not be expected that in the short time which has elapsed since irrigation and water supply became a recognized national question, the whole ground of administration of the water supply of the Colony could have been dealt with. Further legislation is contemplated, and this will doubtless remedy the existing defects. It is not surprising that the constitution of two separate kinds of Water Trusts possessing different powers has given rise to some complications. The majority of the Trusts are termed "Waterworks Trusts," and were constituted under Act 716 of 1881; but recently "Irrigation Trusts" formed according to the provisions of Act 778 of 1883 have become more popular. For instance, at the time of my visit, an agitation was being carried on for the formation of an Irrigation Trust at Cohuna, within the district of the Swan Hill Waterworks Trust, and the agitators seemed confident of success. The Swan Hill Trust had, however, passed a resolution protesting against the transfer of the creeks, and particularly the Barr Creek, to the jurisdiction of the proposed Cohuna Irrigation Trust. So far as I could ascertain, the chief grounds on which some of the former object to the Waterworks Trusts are—(1) that they deal only with the supply of water for domestic use and for stock, and (2) that the members of the Trusts are elected by the Shire Councils, and not by the persons who are interested in irrigation. The first objection appears

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in the main correct, though it is the intention of the Waterworks Trust to allow irrigation to be carried on from their works whenever water can be spared for that purpose. The second objection is a very important one, as it is alleged that under existing circumstances it is possible to have members of Waterworks Trust who take no interest in irrigation, or who are even opposed to it. Another point in connection with the legislation which has not yet been dealt with, is the propriety of defining the right of the State to the rivers and lakes. The following case which arose last year is very suggestive on this subject:—A farmer, who had expended £600 in providing himself with an engine and a centrifugal pump, and who had irrigated 500 acres by pumping from Kow Swamp in two successive years, was served with a summons for illegally using a supply of water belonging to the Swan Hill Trust. The farmer was fined, but the amount of the fine was subsequently remitted by order of the Government. It is safe to infer that, when this man purchased his plant, he believed that his riparian rights entitled him to pump from this swamp; and the undisturbed use of the water for two consecutive seasons could not fail to confirm him in this opinion. Nor would a study of the powers of Trusts, as set forth in Act 716 of 1881, throw much light on the extent to which that law sets aside the British law of riparian rights. The occurrence of cases like these, besides showing that the legislative problems connected with water conservation in Victoria are not all solved, is also instructive to this Colony in exemplifying the nature of the questions which are likely to arise.

In addition to inspecting the works for irrigation in the Gunbower District, and making myself acquainted with the details of the arrangements being carried out by the Waterworks Trusts, I availed myself of the opportunity of visiting the works for the mitigation of the dangers arising at Melbourne from floods in the Yarra, and also of inspecting the works for the water supply at Ballarat.

With regard to the former works, so long ago as February, 1879, the opinion was given by Sir John Coode "that perfect immunity from floods can only be secured by removing the rock obstructions in the bed of the Yarra from just above Prince's Bridge to below Falls Bridge." The dangers of delay in the removal of the Falls Reef was the subject of an important memorandum by Mr. W. H. Steel, the Inspector-General of Public Works, in 1883. Since then the removal of the reef has been put in hand and is now in active progress. Ford's Rock Drills are used for making the blast-holes, which are at regular intervals, and are all carried to 16 feet below low-water. The explosive used is dynamite, in charges varying up to 10 lbs., and the blasts are fired in groups by an electric battery. The débris is lifted into barges by a spoon dredge. Up till February of the present year 33,000 cubic yards had been removed in this manner.

The Ballarat Waterworks have played a similar part in connection with the prosperity of that town and the development of mining enterprise in its vicinity to that of the Coliban Works in the case of Castlemaine and Sandhurst. It is unnecessary here to describe the Ballarat Works in detail, as they are very similar in their general character to the works for the supply of Melbourne. The expenditure on them has been £275,000, and the Ballarat Water Commissioners pay to the Government 4½ per cent. on that amount. The quantity of water now generally used in summer is 3½ million gallons per day, and this includes the supply used for mining, manufactures, and water-power. In winter the required quantity falls to about 3 million gallons per day. When the mining industry was more prosperous the quantity used went as high as 4½ million gallons per day, and this taxed the available supply to the utmost, as the catchment area from which it is derived is only about 7,600 acres in extent. The following are the rates charged for water:—

(*a*) For domestic use in houses valued at £20 per annum or less	£1 per annum.
(*b*) For houses valued at over £20 per annum	5 per cent. on assessment.
(*c*) For manufactures	1s. per 1,000 gallons.
(*d*) For steam-boilers	" " "
(*e*) For crushing purposes	3d. per 1,000 gallons.
(*f*) For motive power	" " "

The working expenses amount to about £4,000 per annum.

The greatest pressure at any part of the mains is 134½ lbs. per square inch or 310 feet of head. The pressure gauge in the office of the Inspector shows about 112 or 113 lbs. per square inch.

While the works are, as a rule, of well-known types, the flume shown in the accompanying plan presents some unusual features. This work consists of a trapezoidal flume of sheet iron of No. 12 gauge, that is of a thickness of less than one-ninth of an inch, supported in a framework of timber. It has been seven years in use, and has given entire satisfaction. It is laid with a fall of 8 feet per mile, or 1 in 660; its length is 920 feet, and its total cost was £1,500. The ironwork is cleaned annually, and coated with a mixture prepared in the proportion of 2 lbs. of tallow and 2 lbs. of resin to 1 gallon of tar. This is put on in hot weather, and at a time when the channel is not in use. It is found that the mixture applied assumes a glassy surface, and does not affect the taste of the water. The erection of this flume was simply and expeditiously done by making it in sections above its bed, lowering the sections by screws, and riveting them together in position.

The Ballarat Water Commission owns 2,300 acres of land outside the limits of the catchment area of the present works. This land is now worth £30 per acre on an average, and the Commissioners have recently let 800 acres at £1 per acre per annum.

It should be mentioned that Mr. C. H. O. Bagge, C.E., was the Engineer who had charge of the design and construction of the Ballarat Waterworks, and that the details regarding them were furnished to me by Mr. J. Cameron, Foreman of Works, who now holds charge of them on behalf of the Commissioners.

For details regarding the Victorian Works mentioned, I am indebted chiefly to the painstaking kindness of the gentlemen referred to in connection with them; but I am also under obligations for valuable assistance to many others, and prominent among them, to Mr. Conant, Mayor of Echuca, Mr. John Tracy, Works Manager on the Gunbower Station, and Mr. Kempson, Engineer to the Swan Hill Waterworks Trust.

H. G. McKINNEY, M.E., M.I.C.E.,
Engineer to the Commission.

24th April, 1886.

APPENDICES TO SECOND REPORT.

APPENDIX I.

UNITED ECHUCA AND WARANGA WATERWORKS TRUST.

Amount of Loan, £116,000; Amount of Grant, £26,756: Total, £142,756.

Instalments of Loan received, £88,797 13s. 10d., expended as under.*

Year.	Pumping expenses.	Head works.	Main channel.	Warialta channel.	N. E. channel, &c.	Eastern drainage channel.	Gingaree channel.	Tanks.	Maintenance.	Land compensation.	Professional expenses.		Non-professional expenses.		
											Surveys and Engineering.	Clerks of Works.	Salaries and allowances.	Contingencies.	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1882	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	778 2 3	.....	.....	16 17 2	794 19 5
1883	.....	.....	2,147 12 0	.....	.....	.....	.....	.....	.....	26 12 0	1,500 0 0	91 0 0	292 3 4	204 18 0	4,262 5 4
1884	.....	.....	16,690 2 3	6,561 19 6	.....	.....	.....	.....	.....	111 12 0	1,830 0 0	228 0 0	279 10 0	137 11 7	25,838 15 4
1885	676 10 3	7,034 12 5	28,785 10 2	564 9 2	10,219 17 6	570 2 0	.....	461 3 10	274 18 0	1,091 14 9	2,075 4 6	478 0 0	275 0 0	251 14 8	52,759 6 3
1886 (pt.)	171 8 9	.....	1,206 11 3	.....	2,536 16 6	.....	616 0 0	14 5 0	160 18 3	196 7 6	.....	104 0 0	75 0 0	61 0 3	5,142 7 6
Total £.	848 8 0	7,034 12 5	48,829 15 8	7,126 8 8	12,756 14 0	570 2 0	616 0 0	475 8 10	435 16 3	1,426 6 3	6,183 6 9	901 0 0	921 13 4	672 1 8	88,797 13 10

* These amounts include total expenditure to date.—W. S. M., 15/3/86.

APPENDIX II.

MELBOURNE WATER SUPPLY.

Water Supply Office,
Melbourne, December, 1885.

SPECIFICATION for the manufacture and supply of Wrought-iron Water Pipes for the use of the Melbourne Water Supply Branch of the Public Works Department.

The whole of the workmanship required in the construction of the pipes the subject of this contract shall be performed within the Colony of Victoria, but the materials of which such pipes shall be constructed, as wrought-iron plates and rivets, may be imported.

The contract shall include the providing of all materials as hereinafter described, and labour for the manufacture, coating, testing, weighing, and delivery of thirty-four thousand three hundred (34,300) feet run, more or less, of wrought-iron pipes of thirty (30) inches diameter, and weighing approximately 1,430 tons, together with all tools, fittings, templets, patterns, premises, and every and all of the appliances necessary for its due fulfilment in accordance with this specification and accompanying drawing.

The materials used in the contract shall be the best of their respective kinds.

The wrought-iron plates shall be of the best brand of Staffordshire, or other brand of equal quality in the opinion of the Chief Engineer, and on each plate the brand must be clearly discernible, and the iron in the plates shall, under such tests as may be ordered by the Chief Engineer, be capable of withstanding a tensile strain of not less than twenty tons per square inch of original section, with an extension of not less than 8 per cent. of the tested length.

The rolled plates for faucets shall be of such a quality that they will withstand a tensile strain of not less than 23 tons per square inch of original section, with an extension of not less than 15 per cent. of the tested length.

The rivets shall be made from the best Lowmoor iron, or of colonial scrap iron, and shall be capable of carrying not less than 26 tons per square inch of original section, with an extension of not less than 18 per cent. of the tested length.

The above tests for plates and rivet-iron are to be made on carefully prepared pieces of the full diameter of the rivets, and for plates they shall have a sectional area of not less than ·75 of a square inch, and they shall have a length in any case of not less than eight inches between the shoulders; all to be cut and tested the length way of the grain. The Contractor shall cut and test pieces from any plate or bar the Chief Engineer or Superintending Officer may indicate; one plate in each fifty being tested if required by the Superintending Officer; and in the event of the selected plate not standing the test, the whole fifty may be rejected.

The Contractor shall provide all suitable appliances, labour, and material for carrying out the tests, and shall prepare the test pieces, and load them to their breaking points whenever required to do so by the Superintending Officer.

The pipes are to be constructed of plates, as described, one quarter ($\frac{1}{4}$) of an inch thick, bent end-on with lap joints longitudinally and transversely, as shown on drawings.

The plates must be of such length as to be equal to the whole circumference of the pipe, together with provision for lap in one piece or plate. The width of the plate shown on the drawing is four (4) feet, but the Contractor will not be restricted to such width if he will substitute therefor plates of greater width; but plates of lesser width than four (4) feet will not be accepted. The lap on the longitudinal joints shall be $2\frac{1}{2}$ inches, the joints to be double riveted with rivets, as described, of half an inch ($\frac{1}{2}$) diameter, pitch one and a half ($1\frac{1}{2}$) inches.

The lap for the transverse seam shall be one and a half ($1\frac{1}{2}$) inches, single riveted with $\frac{1}{2}$-inch rivets, $1\frac{1}{2}$-inch pitch, as described for the longitudinal joints.

The plates are to be riveted up so as to form pipes of about 31 feet in length. Each length of pipe is to be fitted with a socket of rolled iron $\frac{3}{8}$ of an inch in thickness with bead, and of the section shown on drawing, welded into a ring and firmly and tightly riveted to the pipe, so as to resist hydraulic pressure as hereinafter described, by rivets $\frac{5}{8}$ inch diameter and $1\frac{3}{4}$-inch pitch.

The faucet in every case to be riveted on a segment of the pipe of the greater of the two diameters of which the pipe shall be formed, and such rivets in the pipe as shall be found necessary shall be countersunk under the faucet ring.

The rivets in one foot in length of the spigot end of the pipe to be countersunk, to allow of its insertion in the socket of the adjacent pipe.

All seams and joints and rivets shall receive such amount of caulking as shall render them watertight under the test pressure hereinafter to be described.

The pipes shall be perfectly straight longitudinally, and each segment of a pipe shall be perfectly cylindrical, as also shall the socket on each pipe.

Each pipe to be fitted with two lugs as shown, for the purpose of suspension, to be of the dimensions given on drawing, and to be secured to the pipe near the spigot end with two $\frac{1}{2}$-inch rivets in each lug.

The rivet-holes in plates and sockets may be punched, in which case multiple punches shall be used. The holes are to be of the size specified for rivets; they shall be exactly spaced, and shall come into position accurately for receiving the rivets with the least amount of rimering; drifting will on no account be allowed in any part of the work. The punching shall be so performed that the smaller ends of the holes shall come together and the larger ends against the rivet heads, and all burrs resulting from punching shall be removed.

The sizes given for the rivets are the sizes of the rivets when closed in the holes. The rivets must in no case, when cold and before being riveted up, be less than $\frac{1}{32}$ of the diameter of the holes. Any hole through which the rivet will not readily pass must be rimered out until a mandrel of the exact diameter specified for the rivet holes will pass through. The rivets shall be long enough and of a suitable form for making good snap heads inside and out.

All riveting, excepting such as must be countersunk under joints of sockets, shall be executed with hydraulic riveting machines of approved pattern.

Each length of pipe shall be tested by hydrostatic pressure equal to a column of water 350 feet in height, and all leakages developed at such or any less pressure shall be made good and watertight by caulking to the satisfaction of the Superintending Officer.

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In the event of the fracture of a plate, or a rupture of a joint, the pipe in which such fracture or rupture occurs shall be destroyed in the presence of an inspector. The pipes shall be tested either before or after the coating process shall have taken place, as shall be determined from time to time by the Superintending Officer.

All the pipes are to be coated with a composition of refined Trinidad asphaltum and coal tar, in the proportions of 60 per cent. of refined asphaltum and 40 per cent. of tar.

Each pipe before being coated shall be thoroughly dried by being heated above atmospheric temperature, so that when immersed in the coating material the skin of the iron shall be perfectly dry, to secure the perfect adhesion of the coating material; and no pipe shall be permitted to be immersed in the coating bath unless it be so thoroughly dried.

Prior to being mixed with the asphaltum, the tar must be heated to 400 deg. F. and maintained at such temperature so long as shall be necessary, in the opinion of the Superintending Officer, for the release of all obnoxious oils.

The asphaltum and tar, after the latter shall have been heated as described, shall be melted together in a tank or cauldron and run into a bath of suitable size, the amalgamated material to be maintained continuously while coating shall be in progress at a temperature of 300 deg. F.

Each pipe after being heated and dried as described, and before it shall have had time to cool, shall be immersed in such bath so as to be completely submerged, and after remaining therein not less than twenty minutes shall be lifted and suspended by the lugs, socket down, in a vertical position, to allow of dripping. When the coating material shall have sufficiently set, the pipe shall be again submerged in the bath and at once withdrawn, and suspended as before described until the coating shall have partially set. The pipe then to be lowered on to a bed of clean sand, and rolled until the particles of the latter shall have become incorporated with the coating to such degree as shall be directed by the Superintending Officer.

Each length of pipe shall be weighed in the presence of an officer of the Melbourne Water Supply Branch, and payments will be made on the weights so obtained and recorded.

Delivery of the pipes will be taken at the works of the Contractor, if such works be situated within three (3) miles of the Melbourne General Post Office, and if such works be at a greater distance than three (3) miles from such point, delivery must be made by the Contractor at the Tank Premises, Eastern Hill, or at Raleigh's Yard, Queen's Wharf, as shall be directed.

Tenderers shall state the price per ton at which the pipes herein described will be manufactured and delivered in accordance with this Specification; they shall also state the least weight or quantity they will guarantee to deliver per month, the time in which the first delivery will be made, and also a statement of the time required to complete and deliver the entire contract quantity, such time to commence from the date of acceptance of tender and to form a condition of the contract.

APPENDIX III.

[*From the "Victoria Government Gazette" of 3rd August, 1883. No. 76.*]

CASTLEMAINE AND SANDHURST WATER SUPPLY DISTRICT.

RULES AND REGULATIONS.

THE Governor in Council, in pursuance of and in exercise of the powers and authorities conferred by *The Water Works Act* 1865, has made the Rules, Regulations, and Orders following, respecting the Castlemaine and Sandhurst District Water Supply, being a work constructed under the authority of the said Act:—

1. The district which shall be rated for the Castlemaine and Sandhurst District Water Supply shall be the whole of the borough of Castlemaine, the whole of the borough of Chewton, the whole of the united shire of Mount Alexander, the whole of the united shire of Metcalfe, the whole of the city of Sandhurst, the whole of the borough of Eaglehawk, the whole of the shire of Marong, the whole of the shire of Huntley, the whole of the shire of Strathfieldsaye, and that portion of the shire of Maldon comprised in the extension to Winter's Flat.

2. The following rates and charges are those which the owners and occupiers of lands and tenements shall pay in respect of water supplied by the Board within the said district, that is to say:—

(1.) On every house or tenement of £20 annual value and under, One pound per annum.

(2.) On every house or tenement above the annual value of £20, a rate of Five pounds per centum on the amount of the valuation up to £300 inclusive; Three pounds per centum on the amount of the valuation in excess of £300 up to £700; and Two pounds five shillings per centum on the amount of the valuation in excess of £700.

(3.) On every shop, not used as a domicile, above the annual value of £20, a rate of Four pounds per centum on the amount of the valuation up to £300 inclusive; Two pounds per centum on the amount of the valuation in excess of £300 up to £700; and One pound five shillings per centum on the amount of the valuation in excess of £700.

(4.) The rates to be charged for water supplied from stand-pipes shall be One shilling per 100 gallons.

(5.) The rates to be charged for water supplied by the Board from the mains by measure shall be One shilling per 1,000 gallons, except in the cases hereinafter specially mentioned.

(6.) For water supplied from the mains for sluicing purposes, the rate shall be Twopence per 1,000 gallons.

(7.) For water supplied from the main for mining purpose other than sluicing, the rates shall be Fourpence per 1,000 gallons.

(8.) For water supplied from the channels to crushing-mills, pyrites-works, &c., the rate shall be Threepence per 1,000 gallons.

(9.) For water supplied to gardens and nurseries, cultivated for trade purposes, and to cricket-grounds, the rate shall be Sixpence per 1,000 gallons.

(10.) For water supplied to any cemetery, the rate shall be Fourpence per 1,000 gallons.

(11.)

(11.) For water supplied to any public parks or gardens, the rates shall be Sixpence per 1,000 gallons.

(12.) *a.* The rate to be charged for water supplied from the main aqueducts and from any of the branch aqueducts which diverge therefrom shall be One halfpenny per 1,000 gallons, in quantities of not less than one million gallons per month.

b. The rate to be charged for water supplied in fixed quantities of less than one million gallons from any portion of the main aqueduct, or from any of the branch aqueducts, shall be for quantities—

Under 250,000 gallons ... ... 2d. per 1,000 gallons.
Above 250,000 gallons but under 500,000 gallons—
The first 250,000 gallons ... ... 2d. per 1,000 gallons.
For the excess ... ... 1d. „ „
Above 500,000 gallons but under 1,000,000 gallons—
The first 500,000 gallons ... ... 1½d. per 1,000 gallons.
For the excess ... ... ½d. „ „

Delivery of the water shall be taken within one month from the time of purchase, failing which, the purchaser shall forfeit all his right thereto.

3. The minimum quantity of water to be charged for in each case where water is supplied by measure shall be—

(1.) If for domestic and other than domestic purposes, the quantity of which, the charge at 1s. per 1,000 gallons, would be equal to the amount of the assessed rate which would be payable for the premises so supplied, if supplied otherwise than by measure; and

(2.) If for other than domestic purposes only, 25,000 gallons per quarter.

4. A supply of water for domestic purposes shall not include a supply of water to any livery or carrier's stables, or a supply for any manufacturing purposes, or for irrigation (which shall mean any mechanical or artificial contrivance for conveying water to the roots of plants without labour), or for water-power, or for fountains, or for any ornamental purpose. No hose or pipe is to be applied to any pipes or taps for the purpose of watering the ground, or trees or plants, or washing the house walls, or a carriage, or for any similar purpose, unless the water is charged for by meter. Syphon pumps will not be allowed unless the water is supplied by measure.

5. Any person receiving water from the Board who shall take and carry away such water from his premises, or who shall allow any person to take or carry away such water, or shall sell the same to any other person, shall be liable to a penalty not exceeding Five pounds.

6. Any person not having agreed to be supplied by the Board who shall take or carry away water from any drinking tap, trough, or private or public service-pipe, shall be liable to a penalty not exceeding Five pounds.

7. Before any person shall affix any service-pipe to any pipe of the Board, or alter, repair, or in any manner interfere with any pipe of the Board, or any service-pipe, cock, or fitting connected with the pipes of the Board, he shall obtain from the Board a license in that behalf to execute such works; and any unlicensed person affixing, altering, repairing, or in any manner interfering with any such pipe, service-pipe, cock, or fitting as aforesaid, shall be liable to a penalty not exceeding Ten pounds.

8. Before any such license shall be granted by the Board, the person applying for same shall satisfy the Board that he is a competent plumber.

9. Any person, whether licensed as aforesaid or not, who shall offend by opening any ground so as to uncover any pipe or pipes, the property of the Board, without giving two days' notice to the Board of his intention so to do, or who shall in any way tamper with or alter any pipe the property of the Board, without the permission in writing of the Board being first obtained, or who shall wilfully or carelessly break, injure, or open any lock, cock, valve, pipe, work, or engine, the property of the Board, shall be liable for each such offence to a penalty not exceeding Twenty pounds.

10. Any person, whether licensed as aforesaid or not, who shall lay any pipe, to communicate with the pipes of the Board, without giving two days' notice of the day and hour when such pipe is intended to be made to communicate with the pipes of the Board, or who shall make such communication except under the superintendence and according to the directions of some officer of the Board, or who shall lay any leaden or other pipe to communicate with the pipe of the Board, of a strength and material not sanctioned by the Board, shall be liable for each such offence to a penalty not exceeding Five pounds; and in the event of continuing the offence, to a further penalty of Two pounds for each day after notice of the offence from the Board. Wrought-iron piping, of approved quality, and lead piping of the following weights only, will be allowed to be fixed for either internal or external service :—

Diameter of pipe.	Weight of pipe per yard.
⅜ inch	5 lbs.
½ „	6 „
¾ „	7½ „
¾ „	9 „
1 „	12 „
1¼ „	16 „
1½ „	20 „

No service of a larger bore than ½-inch will be permitted, unless by special consent of the Board.

11. If any person shall neglect to repair any service-pipe conveying water from the pipes of the Board into the premises of such person, after having received notice from any officer of the Board that such service-pipe requires repairing, the Board may stop the water from flowing into such premises, either by cutting off the service-pipe or otherwise as to the said Board may seem fit, until the necessary repairs shall have been effected. The service-pipes from the main being the property of the owners or occupiers of the tenements supplied by such service-pipes, the occupier (if any), and if none, the owner, shall in every instance in which any damage shall be caused by reason of such service-pipe being leaky, or otherwise out of repair or broken, be liable to a penalty not exceeding five pounds; and in the event of continuing the offence, to a further penalty of two pounds for each day after notice of the offence from the Board.

12. Any person supplied with water by the Board who shall wilfully or negligently allow the same to run to waste shall be liable for each offence to a penalty not exceeding Five pounds; and in the event of continuing the offence, to a further penalty of Two pounds for each day after notice of the offence from the Board.

13. If any meter should cease registering, and, during the time it is undergoing repairs, the Board shall estimate and charge for the water consumed by taking an average of the quantity used during the previous quarter, or during the corresponding period of the preceding year.

14. Any person, whether licensed as aforesaid or not, connecting any service-pipe or branch service-pipe with any steam-boiler for the purpose of feeding or supplying the same with water, without first affixing a self-acting valve for preventing the pressure of the steam reversing or affecting the dial of the meter, shall be liable to a penalty not exceeding Five pounds; and in the event of continuing the offence, to a further penalty of Two pounds for each day after notice of the offence from the Board.

15. No meter shall be affixed unless the dial of the same is capable of registering one million (1,000,000) gallons.

16. Over-flow pipes to private baths will not be permitted.

17. Water-closets will not be allowed to be supplied direct from the main, but from a cistern only, so constructed that the water cannot flow continuously, and that not more than two gallons can escape at each flush.

18. If any person supplied with water by the Board does or causes to be done anything in contravention of any of these Regulations, or fails to pay his rates when due, or fails to do anything which under any of these Regulations ought not to be done, or wilfully or negligently allows water to run to waste, the Board may cut off the supply of water from the premises of such person, either by cutting the pipes by or through which water is supplied or otherwise, and may cease to supply him with water so long as the cause of injury remains or is not remedied.

19. The streets shall not be watered from hydrants or fire-plugs by means of a hose, but the water is to be applied to the streets by carts or by manual labour, or by special stand-pipes of approved size and form.

20. The water supplied in the above-named district shall be received and consumed under and in accordance with these Regulations, and not otherwise, through pipes and meters laid, placed, and being under and in accordance with the same Regulations, and not otherwise.

21. In the construction of these Rules and Regulations the word "person" shall be deemed to extend to and include a Corporation whether aggregate or sole, and the word "Board" shall mean the Board of Land and Works.

22. The Rules, Regulations, and Orders affecting the Castlemaine and Sandhurst District Water Supply, made on the 7th January, 1878, the 4th February, 1878, the 4th March, 1878, the 12th August, 1878, the 28th October, 1878, the 4th March, 1879, the 28th February, 1881, and the 26th September, 1882, respectively, are hereby repealed.

ALFRED DEAKIN,
Minister of Water Supply.

Office of Mines and Water Supply, Melbourne.

Approved by the Governor in Council, the 16th July, 1883.
ROB. WADSWORTH, Clerk of the Executive Council.

DETAILS REGARDING COLIBAN SCHEME.

STORAGE PROVIDED.

Name of Reservoir.	Capacity in Gallons.	Drainage Area in Acres.	Remarks.
Malmsbury	2,842,000,000	64,000	Main storage Reservoir.
Taradale Tank	65,000	.....	Service Reservoir.
Expedition Pass	128,000,000	3,600	Supplies Town of Castlemaine.
Old Post Office Hill	2,000,000	.....	Service Reservoir.
Barker's Creek	611,000,000	3,427	Distributing Reservoir.
Red Hill	1,250,000	.....	Service Reservoir.
Spring Gully	149,000,000	460	Distributing Reservoir.
Crusoe Gully	320,000,000	690	,, ,,
Big Hill	68,000,000	300	Intercepted by channel around reservoir.
Big Hill Tank	300,000	.....	
Crocodile Gully	5,407,000	450	
Solomon's Gully	1,250,000	Nil.	Service Reservoir—Sandhurst.
Sparrow Hawk Gully	1,500,000	Nil.	,, ,, Eaglehawk
Upper Grassy Flat	58,860,000	1,800	
Lower ,, ,,	26,769,000		
Lightning Hill	6,000,000	Nil.	Service Reservoir—Raywood, Sebastian, and Neilborough.

SLUICING OPERATIONS.

Name of Town and District supplied.	Population.	Approximate Quantity of Water used per Annum by Sluicing and Manufactories.
Taradale	1,466	
Castlemaine and District	8,600	2,281 million gallons.
Sandhurst and District	39,540	365 ,, ,,

[Plans.]

Sydney: Thomas Richards, Government Printer.—1886.

MEMO.:—

The Diagrams and Plans connected with the Second Report from the Royal Commission on the Conservation of Water will be found in a Supplementary Volume.

1885-6.

NEW SOUTH WALES.

COUNTRY TOWNS WATER AND SEWERAGE ACT.

(BOROUGH OF NEWCASTLE—BY-LAWS.)

Presented to Parliament, pursuant to Act 44 Vic. No. 14, sec. 13.

Colonial Secretary's Office,
Sydney, 12th March, 1886.

BOROUGH OF NEWCASTLE.—BY-LAWS.

THE following By-laws, made by the Council of the Borough of Newcastle, under the "Country Towns Water and Sewerage Act," 44 Victoria No. 14, for regulating the supply of water in that Municipality, having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the above-cited Act.

GEORGE R. DIBBS.

BY-LAWS to enable the Council of the Borough of Newcastle to establish a rate for water supply purposes, and for fixing the scale of charges for water supplied by meter, under the powers conferred by the "Country Towns Water and Sewerage Act," 44 Victoria No. 14.

The Council of the Borough of Newcastle doth hereby, pursuant to and in exercise and execution of the powers and authorities conferred by the Country Towns Water and Sewerage Act of 1880, make the following rate, to take effect from the first day of January and the first day of July in each year, upon all lands and tenements within the area of any Water District within which water is authorized to be supplied.

1. The rates and charges hereinafter specified are those which the owners and occupiers of lands and tenements shall pay in respect of water supplied otherwise than by meter for domestic purposes.

2. On every house, tenement, or land there shall be paid to the Council the annual minimum sum of ten shillings, and in no case shall water be supplied at less than that sum.

3. On every house or tenement there shall be paid the rate of five shillings per room for each and every room in such tenement, all out-houses to be excluded, except bath-houses.

4. The charge for water supplied by meter for steam boiler purposes shall be at the rate of two shillings per thousand gallons; the minimum quantity to be charged for water supplied to any such boiler shall be ten thousand gallons per month.

5. The charge for water supplied by meter for manufacturing and other purposes, unless otherwise specified, shall be at the rate of two shillings per thousand gallons; the minimum quantity to be charged for water supplied shall be ten thousand gallons per month.

6. The charge for water supplied by meter to ships and vessels in the Port shall be at the rate of four shillings per thousand gallons, and each party taking water for use of ships, &c., shall provide their own meter.

7. The charge for water supplied by meter to charitable institutions for all domestic purposes shall be at the rate of sixpence per thousand gallons.

8. The charge for water supplied by meter to cricket and bowling clubs shall be at the rate of one shilling per thousand gallons.

9. The charge for water supplied by meter for irrigation, gardens, nurseries, and private fountains shall be at the rate of one shilling and sixpence per thousand gallons.

10. The charge for a temporary supply of water during the erection of new buildings shall be ten shillings per centum on the amount of contract for stonework, brickwork, and plastering, or the Council may require a meter to be fixed, and the charge shall be one shilling and sixpence per thousand gallons.

11. The charge for warehouses and wholesale stores, not being domiciles, shall be four shillings per thousand gallons; the minimum quantity to be charged for water supplied shall be two thousand gallons per month.

12. The charge for water supplied for motive power, public baths, and troughs in streets shall be at the rate of sixpence per thousand gallons.

13. All accounts for water supplied under special agreement or by meter shall be paid monthly.

Made and passed by the Council of the Borough of Newcastle, this twenty-eighth day of December, in the year of our Lord one thousand eight hundred and eighty-five.

(L.S.) C. W. MORGAN,
Mayor.

EDWARD S. HOLLAND,
Town Clerk.

1885–6.

NEW SOUTH WALES.

COUNTRY TOWNS WATER AND SEWERAGE ACT OF 1880.

(MUNICIPAL DISTRICT OF DENILIQUIN—BY-LAWS.)

Presented to Parliament, pursuant to Act 44 Vic. No. 14, sec. 13.

Colonial Secretary's Office,
Sydney, 22nd February, 1886.

MUNICIPAL DISTRICT OF DENILIQUIN.—BY-LAWS.

THE following By-laws relating to the management and regulation of Water Supply, made by the Council of the Municipal District of Deniliquin, under the power conferred by the "Country Towns Water and Sewerage Act of 1880," having been confirmed by His Excellency the Governor, with the advice of the Executive Council, are published in accordance with the requirements of the above-cited Act.

JOHN ROBERTSON.

MUNICIPAL DISTRICT OF DENILIQUIN.

BY-LAWS FOR THE MANAGEMENT AND REGULATION OF WATER SUPPLY.

The Mayor and Aldermen of the Municipal District of Deniliquin, pursuant to and in exercise and execution of the powers and authorities conferred on such Council by the "Country Towns Water and Sewerage Act of 1880," make the following By-laws:—

Previous By-laws repealed.

1. That all existing By-laws and Regulations in connection with water supplied from the Council's works be and the same are hereby repealed, except as to anything already done or committed, or the recovery of any rates or charges due and payable thereunder.

Rates and charges.

2. The following rates and charges are those which the owners and occupiers of lands and tenements shall pay in respect of water supplied by the Council, that is to say,—

(a) On every house or tenement of £25 assessed annual value and under, if not supplied by meter or special agreement, twenty-five shillings per annum.

(b) On every house or tenement above the annual value of £25, if not supplied by meter or special agreement, a rate of one shilling for each pound sterling on the amount of the assessed Municipal valuation up to £200 inclusive, and three pounds (£3) per centum on the amount of assessed valuation on all the amounts in excess of £200.

(c) Livery and coach-horse stables and hotel premises where horses are generally kept, to be supplied by meter.

(d) Water supplied for irrigation of gardens, ornamental grounds, manufactories, or otherwise, when more than ordinary consumption is required, shall be by meter.

(e) Tenements built and used for storage purposes only above £50 annual value, and not having supply or stand-pipes laid on, shall be subject to a rate of £2 10s. per centum per annum on assessed valuation.

(f) Public horse troughs 10s. per annum, steam boilers 10s. per annum for each horse-power of such steam boiler; water carts from stand-pipes 6d. per load of 50 gallons or less.

(g) Unimproved town allotments and suburban lands if not distant more than 150 feet from any main or pipe of the Council's, shall be charged a minimum rate of 2s. 6d. per allotment up to £50 assessed capital value, all in excess of this 5 per centum on assessment.

(h) Water supplied to hospitals or other charitable institutions shall be by special agreement.

(i) For water supplied temporarily to buildings in course of progress 20s. per centum on the amount of the contract for stonework, brickwork, and plastering, or the Council may require a meter to be fixed, the charge to be the ordinary one in use for water supplied by measure or by agreement.

(j) Water required for market gardens or for purely agricultural purposes may be supplied by measurement at such times and at such charges as the Council may agree to.

(k) For water supplied by the Council by measurement the charge will be (except in cases referred to in preceding section) at the rate of one shilling and sixpence per one thousand gallons.

(l) The minimum quantity of water to be charged for in each case where water is supplied by measure (except by agreement) shall be equal to what would have been charged for the premises so supplied is supplied otherwise than by measure, but in no case shall less than 25,000 gallons per quarter be charged for.

The foregoing to be subject to section 13 of the "Country Towns Water and Sewerage Act of 1880."

These By-laws were made and passed by the Municipal Council of Deniliquin, and the seal of the said Council was hereunto affixed the twenty-first day of December, one thousand eight hundred and eighty-five.

(L.S.) ALFRED JAMESON,
Mayor.

GEORGE MINTO,
Council Clerk.

1885-6.

NEW SOUTH WALES.

COUNTRY TOWNS WATER AND SEWERAGE ACT.

(NOTIFICATION OF CONSTRUCTION OF WORKS FOR WATER SUPPLY FOR BOURKE.)

Presented to Parliament, pursuant to Act 44 Vic. No. 14.

Department of Public Works, Sydney, 18th August, 1886.

NOTICE is hereby given that His Excellency the Governor, with the advice of the Executive Council, has been pleased, under the powers conferred upon him in that behalf by the 124th section of the Country Towns Water and Sewerage Act of 1880, 44 Vic. No. 14, to authorize the construction, under the direction of the Minister of Public Works, of the necessary works for water supply for the Town of Bourke, at the request, and pursuant to the resolution of, the Municipal Council of the said Town, copy of which Resolution is appended hereto for general information.

Dated in Sydney, this 18th day of August, 1886.

WILLIAM JOHN LYNE,
Minister for Public Works.

Copy of Resolution submitted to and passed by the Council of the Municipal District of Bourke, at a meeting of the Council thereof, held on the 28th day of June, A.D. 1886 :—

Present: His Worship the Mayor (in the Chair), and Aldermen Biddulph, Donohoe, Huggins, Bloxham, Daniell, Colless, and Gray.

Moved by Alderman Huggins, seconded by Alderman Gray, and carried unanimously :—"That the Council of the Municipality of Bourke having taken into consideration the question of water supply for the Town of Bourke, do hereby request His Excellency the Governor, with the advice of the Executive Council, to take all such steps and cause such works to be executed as may be necessary to provide a water supply for the Town of Bourke, and the said Council, on behalf of the Municipality of Bourke, hereby agree to do and undertake all liabilities and obligations mentioned in section 125 of the Act 44 Vic. No. 14, and it is hereby expressly agreed that such liability is accepted for the total amount to be expended on such works, whatever such amount may be."

J. T. READFORD,
Mayor.

[3d.] 1022—

1885–6.

NEW SOUTH WALES.

WATER SUPPLY, TOWN OF WENTWORTH.

(NOTIFICATION.)

Presented to Parliament, pursuant to Act 44 Vic. No. 14.

Department of Public Works, Sydney, 22nd October, 1885.

NOTICE is hereby given that His Excellency the Governor, with the advice of the Executive Council, has been pleased, under the powers conferred upon him in that behalf by the 124th section of the Country Towns Water and Sewerage Act of 1880, 44 Vic. No. 14, to authorize the construction, under the direction of the Minister of Public Works, of the necessary works for Water Supply for the town of Wentworth, at the request, and pursuant to the resolution of, the Municipal Council of the said town,—copy of which resolution is appended hereto for general information.—Dated at Sydney, this 22nd day of October, 1885.

JOHN RAE,
Under Secretary for Works.

COPY of a resolution submitted to and passed by the Council of the Municipality of Wentworth, at the regular meeting of the Council, held on the (10th) tenth day of February, 1885:—

"That the Council of the Municipality of Wentworth having taken into consideration the question of a Water Supply for the town of Wentworth, do hereby respectfully request that His Excellency the Governor, with the advice of the Executive Council, will be pleased to take such steps and cause all such works to be executed as may be necessary to provide a Water Supply for the said town of Wentworth, and the said Council on behalf of the Municipality of Wentworth, do hereby agree to undertake all the liabilities and obligations mentioned in section 125 of the Act 44 Victoria No. 14, and it is hereby expressly agreed that such liability is accepted by the said Council for the total amount expended on such works, whatever that amount may be."

W. J. HOLDING,
Mayor.

Council Chambers, Wentworth, 11th February, 1885.

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

SYDNEY WATER SUPPLY.

(REPORT OF SIR JOHN FOWLER ON PROSPECT DAM.)

Ordered by the Legislative Assembly to be printed, 7 April, 1886.

Sir John Fowler to The Minister for Works.

Sir, Sydney, 23 March, 1886.

I have the honor to acknowledge your request that I should examine the works of the Prospect Dam, now in course of construction.

The object of my examination, as you explained to me personally, was solely with reference to the stability of the dam and the works immediately connected therewith, and not with reference to the merits of the whole scheme as a Water Supply to Sydney, either as regards itself, or in comparison with any other scheme.

Under these circumstances, I do not consider it necessary to make you a detailed report on the subject.

Before proceeding to the site of the dam I thought it proper to examine, at Mr. Moriarty's office, not only the detailed drawings of the dam itself, but also those of the works for admitting the water into the dam, and those for drawing off the water by the watercourse to Sydney, by the waste weir, and by the pipes for emptying the reservoir, all works of the hightest importance, and intimately connected with the efficiency and safety of the dam.

I also checked the various hydraulic calculations, and made my own, so far as appeared to me to be necessary for the objects of my report; and I also availed myself of the valuable information on rainfall obtained by Mr. Russell, the Government Astronomer.

I was anxious to investigate these questions, from the fact, which is well known to you and to every one in the Colony, that the periods of rainfall and drought, and the quantity of rain at various times, are more irregular than in England, and therefore the provisions for adequate storage, overflows, &c., must be far greater.

The important duty of examining the character and quality of the work on the spot was my next step.

Fortunately the present condition of the works is peculiarly favourable for this practical examination, as every part and description of work is in progress, and open to view.

I was accompanied over the works by Mr. Moriarty, Mr. Darley, and Mr. Ryan, the resident engineer, and also by the contractor and his resident manager.

The quantity of material already placed in the dam is something more than one-third of the whole, and, at the present rate of progress, about three years will be required for its perfect completion.

I do not consider this time too great for the purpose, and fortunately there is no temptation to adopt undue haste, as the water brought into the dam will be available for Sydney, in a greater or less degree, during the whole process of construction.

The inside and outside slopes are those usually adopted for dams of the largest class, and in the case of the excellent materials at Prospect are ample.

The pitching to protect the inner slope against the action of the water and the waves is unusually good, from the heavy, hard character of the stone found on the spot.

The top of the bank (which is a roadway 30 feet wide) is intended to be 8 feet above the level of the waste weir, and will be protected by a substantial wall against any possible injurious wash of the waves.

The local conditions for the construction of a dam of the magnitude of the Prospect Dam are unusually favourable.

The material for the dam itself, and that for the puddle trench, are exactly of the character which an engineer would most desire, and are procured on the site itself, or immediately adjacent.

The mode of executing the work by means of thin layers of earth, consolidated by carts and heavy rollers, and the working of the clay in the puddle trench, indicate careful supervision, both on the part of the engineers and contractor and their respective representatives.

A superficial view of the operations might indeed lead an inexperienced person to the opinion that the mode of carrying on the work was somewhat in excess of necessity, but for a work of such magnitude and importance this great care is well bestowed.

There is one point on which I should like to make a few special remarks.

The site of the dam is on clay of good quality, although of varying thickness, and Mr. Moriarty, or any other engineer, might possibly have been led to the opinion that the puddle trench could have been safely founded upon and worked into this clay.

The failures of important waterworks dams have been very few.

Perhaps the most disastrous in its consequences was the well-known failure of a dam at Sheffield. The consequences were so serious in every respect that the authorities required a special investigation into the cause and circumstances; and I was requested, in conjunction with Mr. La Trobe Bateman and two other engineers, to make this investigation.

The result was, we unanimously agreed and reported that the disaster was occasioned by the sliding of the clay foundation of the dam and puddle trench (under the pressure of a landslip in an adjacent hill) upon the shaly rock beneath.

With the terrible experience of the Sheffield disaster, Mr. Moriarty has acted prudently and well in not depending on the irregular clay foundation for his puddle wall.

By taking his puddle wall into the shale below the clay he has secured absolute safety for his work.

The depth of this puddle wall below the surface varies considerably, and this could only be ascertained as the shale was reached by the excavation; and although the depth on the average exceeds the original contract depth, this contingency could not possibly have been foreseen, and is, fortunately, far less than has frequently been found to be necessary under geological conditions of an analogous character.

I examined personally the character of this shale, and found it a perfectly solid and impervious substance.

It was not unnatural that after the Sheffield disaster it was thought prudent and desirable that other waterworks dams, and works connected with them, in England, should be professionally examined.

I was selected to perform the important duty for the Glasgow Waterworks, in conjunction with Mr. Bateman; and it was a great satisfaction, after minute investigation, that we were able to make a perfectly favourable report, which subsequent experience has confirmed.

With respect to the Prospect Dam, it gives me great pleasure to be able to report that the dam itself, and the masonry, tunnels, and works connected therewith, are of a character worthy of their importance, and creditable to all persons connected with them, and that no anxiety need be entertained of their sufficiency and safety.

I have, &c.,

JOHN FOWLER.

POSTSCRIPT.

It may be interesting to record, in connection with this report on the Prospect Dam, that the puddle trenches of several well-known and successful dams have been taken to a far greater depth into the ground than is being done in the case of the Prospect Dam. For instance—for the Yarrow Reservoir, near Liverpool, the puddle trench was taken 97 feet into the solid, as compared with 50 feet at the Prospect, and many other dams are of greater or equal height, viz.:—the Yarrow Reservoir, with 100 feet above the natural surface; the Grenwith, at Bradford, with 87 feet; the Barden, at Bradford, 80 feet; the Silsden, at Bradford, 88 feet; whilst the Prospect Dam is 83 feet.

There are many others of at least equal height in different parts of the world, and in India several are of greater magnitude as regards cubical contents.—J.F.

Sydney: Thomas Richards, Government Printer.—1880.

[3d.]

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

BOTANY WATER SUPPLY DAMS.

(CORRESPONDENCE RESPECTING ALLEGED POLLUTION OF.)

Ordered by the Legislative Assembly to be printed, 4 February, 1886.

The Medical Adviser to the Government to The Principal Under Secretary.

Board of Health Office, 127, Macquarie-street,
Sydney, 13 January, 1886.

Sir,

I have the honor herewith to transmit a report from the Deputy Medical Adviser on the subject of possible pollution of the Sydney water supply from a vast mass of nightsoil which has been deposited in the neighbourhood of the engine-pond at Botany.

The state of matter disclosed is one which cannot fail to produce in the public mind feelings of both disgust and alarm, and I recommend that no time be lost in taking steps to secure the water reserve from all possible pollution.

On Saturday last, when in the neighbourhood of Randwick, I observed a considerable heap of house refuse which had been deposited on a sand-hill on that side of the watershed which drains into the water reserve, and I have no doubt that careful inspection would detect the existence of similar accumulations in other situations equally dangerous. I entirely coincide in the recommendations of the Deputy Medical Adviser, which are practically—(1.) That a careful examination of the whole water reserve should be made at once, with special reference to its boundaries, so as to discover what other filth accumulations, if any, have taken place; and (2.) That this Department should be charged with the duty of keeping up a daily supervision of the whole of the catchment area, so that any future pollution might be at once detected and put a stop to.

I have, &c.,
H. N. MACLAURIN,
Medical Adviser to the Government.

[*Enclosure.*]

The Deputy Medical Adviser to The Medical Adviser to the Government.

12 January, 1886.

It having been asserted that nightsoil had been tipped in dangerous proximity to the Botany dams, I visited the locality pointed out this afternoon, and I have the honor to make the following report and suggestions:—I found the place to be flat, having a south-easterly fall, bounded on the east by the Botany Road, on the south by Blackwater Creek, at a distance from the north boundary, and by a wooded ridge at a less distance from the said boundary, on the south-west and west by the same ridge curving round towards the north, and on the north by Lord's Road. The area of this flat is not large. Its drainage, in the direction of the fall mentioned, renders the land at the foot of the ridge swampy; and at the east end of the ridge (which is abrupt) a small creek begins to form, which turns the ridge, and soon afterwards falls into Blackwater Creek. Blackwater Creek runs from about the point indicated in a course which is parallel with the westerly bank of the engine-pond, and for a long distance close to it. The nightsoil carts have been in the habit of turning off Lord's Road into the bushes which cover the flat, and have there cast their contents on the surface. A very large quantity has been thus thrown down, and the surface covered with the soil is very considerable. It will be washed into Blackwater Creek by the route described at the first heavy rains, and, no doubt, much has been so washed already. Blackwater Creek has for long carried foul water. As its course could not be altered, it was necessary to provide an effectual separation between it and the adjacent engine-pond (which has an area of 50 acres); and this has been done by raising an embankment between the two. This forms the bank of the pond, and is within 2 or 3 feet of the bank of the creek. It will now be clear that the dam is in no danger of direct contamination with this nightsoil, which must enter Blackwater Creek, and that the only question to be asked with regard to the purity of the water supply is: Is the embankment a sufficient barrier, and is it in good order? And these, I believe, are questions for the City Engineer. At present the water in the dam appears to be (and, I am told, is) a little above the level of the creek. To the present height of water, then, the bank is impermeable, for otherwise the level of water within the dam would be lowered. But, after rain, Blackwater Creek would rise, and perhaps above the level of the water within the dam; it would then test another part of the embankment. I observed that the creek is overgrown with weeds, and that the channel is otherwise obstructed; and I think it desirable that, under the circumstances described, it should be cleaned out, and the flow through it rendered as easy as possible. But, with regard to the tipping of nightsoil in this situation, that is an intolerable nuisance, and dangerous to health. There is a considerable number of people near enough to be affected by it, and they complain seriously of it. Further, although it is clear that the soil cannot find its way into the water direct, and although it may be shown that it cannot percolate through the bank, it is at least disgusting that it should be thrown where it must be washed into close proximity to the dams. And, lastly, although it might be freely passed to the bay by the creek, it must there pollute the foreshore, across which the wind blows over the 50 acres of water in the engine-pond. The ease with which

water

water takes up noxious gases from the air around it is well known. In addition, dried and pulverized fœcal matter must, with certain winds, be blown from the flat direct to the water. You have recently drawn attention to the presence of a very considerable heap of dusthole refuse upon the water reserve behind the racecourse at Randwick. The components of this stuff, and of the street sweepings which usually accompany it, are in large proportion organic matters in a state of decomposition. Nightsoil is, of course, popularly known to be obnoxious; but probably it is not known generally that, from many points of view, dusthole refuse is scarcely less objectionable. This heap, then, is at the present moment polluting the town water, and in a way which is not only serious because of its comparatively small size, but if the water reserve is a place recognized by the City Corporation as proper to receive this kind of refuse, there is every probability that upon due search other such heaps may be discovered. It appears to me that in the two circumstances here described there is sufficient evidence that the water supply of this city is not guarded by its legal protectors with scrupulous care. The water reserve should be kept absolutely sacred; upon its cleanness depends the purity of the water, and upon the latter depend the lives of the citizens. I need not dwell upon this. I suggest that measures should be at once taken to ensure the necessary care which at present seems to be lacking. These, it appears to me, might be sufficiently simple:—(1) A survey of the reserve and its marshes might be called for, with a view of removing filth from its surface and its neighbourhood; (2) a sufficient number of rangers might be engaged to keep the whole catchment area under daily supervision; (3) the rangers should not be in the employment of the same body that is charged with the disposal of nightsoil and dust-hole refuse, but should be officers of this department, and should report to you.

J. ASHBURTON THOMPSON, M.D.

Minute of Principal Under Secretary.

Dr. MacLaurin should at once place himself in communication with the Mayor, and make such arrangements as will enable a proper daily supervision to be exercised over the catchment area of the Botany watershed to ensure its being preserved from pollution.

Approved.—JOHN ROBERTSON.

The Principal Under Secretary to The Mayor of Sydney.

Sir, Sydney, 15 January, 1886.

12 Jan. 1886. In transmitting to you the enclosed copy of a letter from the Medical Adviser to the Government, submitting a report on the possible pollution of the water supply of Sydney through certain deposits in the immediate neighbourhood of the engine-pond at Botany, I am directed by the Colonial Secretary to inform you that Dr. MacLaurin has been requested to place himself in communication with you on the subject.

I have, &c.,
CRITCHETT WALKER,
Principal Under Secretary.

The Principal Under Secretary to The Medical Adviser to the Government.

Sir, Sydney, 15 January, 1886.

With reference to your letter of the 13th instant, submitting a report on the possible pollution of the water supply of Sydney through certain deposits in the immediate neighbourhood of the engine-pond at Botany, I am directed by the Colonial Secretary to request that you will place yourself in communication with the Right Worshipful the Mayor of Sydney on the subject.

I have, &c.,
CRITCHETT WALKER,
Principal Under Secretary.

The Medical Adviser to The Government to The Principal Under Secretary.

Sir, Office, 127, Macquarie-street, Sydney, 19 January, 1886.

I have the honor to report that, in compliance with the instructions of the Colonial Secretary, I have this morning had an interview with His Worship the Mayor of Sydney respecting the risk of pollution of the Water Reserve by deposits of night-soil and house refuse.

At the interview were present the City Engineer, the City Health Officer, and the Inspector of Nuisances. After careful consideration it was agreed that an inspection of the whole catchment area of the Water Reserve should take place immediately, under the superintendence of Mr. Trevor Jones, as representing the Mayor, and Dr. Ashburton Thompson, as representing this Department.

The Mayor agreed to appoint a sufficient number of rangers to ensure a satisfactory daily examination of the water area, and to instruct these rangers to report regularly the condition of the Water Reserve to this Department.

I have, &c.,
H. N. MACLAURIN,
Medical Adviser to the Government.

Sydney: Thomas Richards, Government Printer.—1886.

[3d.]

1885-6.

NEW SOUTH WALES.

LANDS FOR PUBLIC PURPOSES ACQUISITION ACT.

(RESUMPTIONS FOR WATER SUPPLY—SYDNEY AND SUBURBS.)

Presented to Parliament, pursuant to Act 44 Vic. No. 16, sec. 6.

NOTIFICATION OF RESUMPTION OF LAND UNDER 44 VICTORIA, No. 16.

NEW SOUTH WALES, to wit. } By His Excellency The Right Honorable SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called Lord AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

(L.S.)

AUGUSTUS LOFTUS, *Governor.*

WHEREAS I, the Governor aforesaid, with the advice of the Executive Council of the said Colony, have duly sanctioned the carrying out of certain works for and in connection with the supply of water to the City of Sydney and its suburbs in the said Colony, for and towards the completion of which said works public funds are available under the provisions of the "Public Works Loan Act of 1879": And whereas the lands hereinafter described are required for the construction of the said works: Now, I, the Governor of the said Colony, with the advice of the Executive Council of the said Colony, in pursuance of the powers in this behalf given to or vested in me by the "Lands for Public Purposes Acquisition Act," do by this notification, published in the Gazette and in a newspaper, that is to say, in the "Sydney Morning Herald," circulated in the Police District wherein the said lands are situated, declare that the lands hereinafter described have been resumed for the public purposes hereinafter mentioned, that is to say, for and in connection with the supply of water to the said City of Sydney and its suburbs, to the intent that, upon the publication of this notification in the Gazette, the legal estate in the said lands shall forthwith be vested in the Minister for Public Works and his successors, on behalf of Her Majesty, for the purpose of the said last-mentioned Act, for an estate of inheritance in fee simple in possession, freed and discharged from all trusts, obligations, estate, interests, contracts, charges, rates, rights-of-way, or other easements whatsoever; and to the intent, further, that the legal estate therein, together with all powers incident thereto, or conferred by the said Act, shall be vested in the said Minister as a trustee, with the powers stated in the said last-mentioned Act. And I declare that the following are the descriptions of the lands hereinbefore referred to, that is to say:—

1. All that piece or parcel of land situated in the parish of Liberty Plains, county of Cumberland, and Colony of New South Wales, containing 6 acres 2 roods 7 perches or thereabout, being part of a grant of 625 acres to Joseph Hyde Potts: Commencing on the eastern boundary of the said grant (which is also the western boundary of 1,340 acres 1 rood 0 Crown Land purchased by the Crown from Messrs. Benjamin and Cohen), at a point bearing north and distan 154 chains 72 links from the south-east corner of the said grant to Potts (being also the south-west corner of the said Crown Land marked by a stone post numbered broad-arrow 27); and bounded on the east by the said Crown Land, being a continuation of the aforesaid boundary bearing north 5 chains 15 links; thence on the north by other part of the said 625 acres grant, as follows:—south 74 degrees 31 minutes west 3 chains 41 links, south 73 degrees 19 minutes west 4 chains 64 links, south 83 degrees 39 minutes west 8 chains 95 links, and north 75 degrees 42 minutes west 8 chains 95 links; thence on the south by land, the property of the Crown, resumed by notification in the Government Gazette of the 21st October, 1881, as follows:—south 65 degrees 23 minutes east 12 chains 51 links, by 2 chains 91 links of a concave curve of 14 chains radius, the chord of which bears south 80 degrees 45 minutes east 2 chains 88 links, by a line bearing north 4 degrees 48 minutes west 1 chain 52 links; thence north 75 degrees 12 minutes east 7 chains 57 links; thence south 4 degrees 48 minutes east 3 chains 3 links; thence by 1 chain 66 links of a concave curve of 14 chains radius, the chord of which bears north 67 degrees 40 minutes east 1 chain 66 links; thence by a line bearing north 63 degrees 32 minutes east, to the point of commencement, and said to be in the possession and occupation of Messrs. Potts and Frazer.

2. All that piece or parcel of land situated in the parish of Liberty Plains, county of Cumberland, and Colony of New South Wales, near Druitt Town, being part of lots Nos. 9, 8, 7, 6, 5, 4, and 3 of a sub-division of a grant of 500 acres to Wm. Roberts: Commencing on the northern side of the Liverpool Road at the south-western corner of lot No. 9; and bounded thence on the west by lot No. 10, bearing northerly 55 links; thence on the north by other parts of the said lots Nos. 9 to 3 bearing north 89 degrees 58 minutes east about 24 chains 40 links to Cook's River; thence on the east by that river southerly about 1 chain; thence on the south by other parts of the said lots Nos. 9 to 3, bearing south 89 degrees 58 minutes west about 22 chains 58 links to the Liverpool Road; thence again on the south by that road westerly, to the point of commencement, containing 2 acres 1 rood 24 perches or thereabouts, and said to be in the possession and occupation of H. Brown, C. Northcote, — Reardon, and others not yet ascertained.

3. All that piece or parcel of land situated in the parish of Concord, county of Cumberland, and Colony of New South Wales, being part of lot No. 11 of 9 acres of the Redmyre Estate, contained in certificate of title, vol. 180, folio 28: Commencing on the western side of the Homebush Road, at a point bearing north 2 chains 19 links from the north-east corner of lot No. 12 of the said estate; and bounded thence on the south by other part of said lot No. 11 bearing west 14 chains

86 links; thence on the west by land of J. F. Josephson bearing north 1 chain; thence on the north by other part of the said lot No. 11 bearing east 14 chains 86 links to the Homebush Road; thence on the east by that road bearing south 1 chain, to the point of commencement, containing 1 acre 1 rood 37¾ perches or thereabouts, and said to be in the possession and occupation of A. Hancock and Dr. Foucart.

4. All that piece or parcel of land situated in the parish of Petersham, county of Cumberland, and Colony of New South Wales, being part of a grant of 100 acres to John Thomas Prentice, called "Hammond Hill Farm": Commencing on the western side of the Balmain Road at a point distant 273 feet and bearing northerly from the intersection of the said western side of the Balmain Road with the northern side of the Parramatta Road; and bounded thence on the east by the Balmain Road bearing northerly 231 feet; thence on the north by C. Hearn's land bearing south 77 degrees 23 minutes west about 190 feet 9 inches; thence on the west by the Elswick Estate bearing south 2 degrees 15 minutes east 234 feet 9 inches; thence on the south by lands of C. Hearn and — Gale bearing north 77 degrees 23 minutes east about 227 feet, to the point of commencement, containing 1 acre 0 roods 17¾ perches, or thereabouts, and said to be in the possession and occupation of C. Hearn.

In witness whereof I have hereunto set my Hand, and caused the Great Seal of the Colony to be hereto affixed, at Government House, Sydney, this sixth day of October, in the year of our Lord one thousand eight hundred and eighty-five, and in the forty-ninth year of Her Majesty's Reign.

By His Excellency's Command,

F. A. WRIGHT.

GOD SAVE THE QUEEN!

Sydney: Thomas Richards, Government Printer.—1885.

[3*d*.]

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

TEMPORARY WATER SUPPLY FOR SYDNEY.

(PAPERS.)

Ordered by the Legislative Assembly to be printed, 26 November, 1885.

SCHEDULE.

TEMPORARY WATER SUPPLY FOR SYDNEY.

No. 1.

The Engineer-in-Chief to The Secretary, Gaslight Company.

Sir, Harbours and Rivers Department, Sydney, 9 May, 1885.

Would you kindly inform me if your Company could lend 250 lengths of 30″ main in the event of their being required in connection with the Sydney Water Supply.

I have, &c.,
E. O. MORIARTY.

No. 2.

The Secretary, Gaslight Company, to The Engineer-in-Chief.

Sir, Australian Gaslight Company's Office, Sydney, 12 May, 1885.

I do myself the honor to acknowledge the receipt of your letter of the 9th instant, inquiring if this company could lend 250 lengths of 30″ main for the water supply, and to inform you in reply that we do not use this size of pipe and consequently have none in stock.

I have, &c.,
W. JOHNSTON,
Secretary.

Seen. What are the largest pipes the company have, and whether they might be able to lend in case of their being required in the event of a water famine in Sydney? Write.—E.O.M., 12/5/85. Wrote.—J.W., 14/5/85.

No. 3.

The Engineer-in-Chief to The Secretary, Gaslight Company.

Sir, Harbours and Rivers Department, 14 May, 1885.

I have to acknowledge the receipt of your letter of the 12th instant, stating that your Company do not use 30-inch mains, and should now be glad, if you would kindly inform me, what are the largest pipes your company have and the number you might be able to lend in case of their being required in the event of a water-famine in Sydney? I have, &c.,
(for E. O. MORIARTY),
J. BARLING.

No. 4.

The Secretary, Gaslight Company, to The Engineer-in-Chief.

Sir, Australian Gaslight Company's Office, Sydney, 19 May, 1885.

I have to acknowledge receipt of your letter of the 14th instant, and in reply thereto beg to say that we have 36-inch pipes, imported for our trunk main now being laid from the Mortlake Station, and of these 1,000 to 2,000 yards can be spared if satisfactory arrangements can be made with the contractor for suspending his contract for a few months.

If this can be done the directors are willing to sell the pipes to the Government at once.

The directors prefer to sell the pipes, because when parted with to the Government it will be necessary for them to cable for a fresh supply for the contractor's work, but if lent and returned the Company would be forced to keep a size in stock which is very rarely used.

I have, &c.,
W. JOHNSTON,
Secretary.

No. 5.

The Secretary of Gaslight Company to The Engineer-in-Chief.

Sir, Australian Gaslight Company's Office, Sydney, 21 May, 1885.

In reply to your telephone message of yesterday I beg to say that the 36-inch pipes weigh 38 cwt. each, and the charge will be £6 6s. (six pounds six shillings) per ton, delivered at our Mortlake Works, on the Parramatta River. I have, &c.,
W. JOHNSTON,
Secretary.

Submitted.—1st June, 1885. The Minister for Works.—A.S., 2/6/85. The Under Secretary for Public Works.—B.C., 2 June, /85. J.B. for P.U.S. Submitted.—J.R., 3/6/85.

No. 6.

The Engineer-in-Chief to the Under Secretary for Public Works.

Sir, Department of Public Works, Harbours and Rivers Branch, Sydney, 28 May, 1885.

I have the honor to state, for Mr. Secretary Wright's information, that in company with Mr Jones, the City Engineer, I have examined the state of the Botany watershed, as well as some other sources from which the present supply may be supplemented in the event of a continuance of the present unusually dry weather. At

At the time of our visit on the Botany watershed all the reservoirs might be said to be exhausted, and the supply to the city was dependent on the Lachlan stream, which showed about ½ million gallons flowing into the tunnel, and on about 4¼ million gallons passing over the gauge-board near Botany per day. Since the date of our visit, about three weeks ago, the stream has fallen off a little, and now shows about 3¾ million gallons per day, which is a better condition of the supply than obtained in April, 1881, when the stream fell short of what it is at present.

Any further falling off will, judging from all previous experience, be gradual and slow.

The judicious measures which have been adopted by the Mayor and City Engineer to diminish waste have had the effect of bringing the consumption within the supply, without, as a rule, subjecting the citizens to any very serious inconvenience, and I have no doubt, that with more experience of the working of the intermittent system, aided by the increased supply which may be obtained, if required, from other sources, that there is no reason to apprehend anything in the shape of a water famine, at all events for the present.

But, although there may not be any great reason to apprehend an immediate failure of the supply, it is perhaps right that we should consider what steps should be taken to provide against the effect of a dry winter and spring.

If such should occur there can be little doubt but that the Botany stream would fail to supply the requisite quantity, and the citizens might be subjected to much inconvenience if entirely dependent on it. It might therefore be worth while considering about obtaining a supply from the Nepean and Cataract Rivers, by means of temporary flumes and pipes; and I have had estimates prepared for a project of this kind.

With the exception of the permanent flumes, the contract for which has been taken in England, the permanent works, that is to say, about 46 miles in length of the permanent work of the canal and tunnels may be said to be completed, so that in a short time the water of the Nepean may be let down to within about 16 miles of Sydney.

Of the remaining portion, tenders for the wrought-iron pipes, 4½ miles, are to be received in July next, and a contract has been entered into for the supply of 11½ miles of 48″ and 42″ cast-iron pipes required to deliver the water to Crown-street, some 1,000 tons of which were shipped early in April.

But as the permanent work would not be ready in time it may be worth considering the expediency of bridging the uncompleted portion by means of temporary fluming and piping, and I have had estimates prepared of the cost of doing so.

As regards the temporary works down to Pott's Hill, that is to say, to within 11½ miles of Sydney, which are estimated to cost about £30,307, the whole would be rendered unnecessary in the event of a moderately heavy fall of rain occurring.

But the 11½ miles of 18-inch pipes, which I estimate at £41,400, would not be wasted, as they would come in for the reticulation of the western suburbs after the permanent works are completed.

These pipes would deliver about 2½ million gallons per day into the engine pond in Botany, from which it might be pumped to Crown-street.

I mention this arrangement because of the much larger body of water the pipes would deliver to the low lands of Botany than would be possible to Crown-street.

The flumes, which would consist of a corrugated iron trough supported on a framing of oregon timber, would be capable of carrying 17½ million gallons per day, and the sheet-iron pipes across Duck Creek would carry 9½ million gallons per day.

I refrain from making any recommendation in favour of or against undertaking these temporary works, and have confined myself to sketching out what might be done to provide against the effect of a dry winter and spring. The Minister for Works is quite as capable, as I can claim to be, of forming a judgment of the probability or otherwise of the continuance of the present drought; but I may state that my own belief is that we shall have rain before the winter is out.

I may add in conclusion that I have had the advantage of discussing the question of water supply with the Railway authorities, and am therefore in a position to be able to state, that should the city be driven to extremities, without having recourse to the more expensive projects, the Railway Department would be able, with a very moderate outlay of about say, £5,000, to bring from Penrith about 1,000,000 gallons of water per diem, which would very materially supplement the Botany supply, should that be reduced to the lowest ebb.

The water thus brought from the Nepean by train could be easily pumped into the Crown-street Reservoir, and distributed through the present city reticulation.

I have, &c.,
E. O. MORIARTY,
Engineer-in-Chief for Harbours and Rivers.

Veteran Swamp.

P.S.—In company with the Hon. Richard Hill, and Mr. McElhone, M.P., I visited the Veteran Swamp, which flows into Botany Bay about half-a-mile beyond the "Sir Joseph Banks Hotel," and where, judging from the eye, I should say nearly a million gallons of water were flowing. If the water should be found on analysis to be good, which it appears to be, it might without difficulty, and at a trifling cost, be pumped into the engine pond.

No. 7.

The Town Clerk, Sydney, to The Principal Under Secretary.

Sir, Town Clerk's Office, Sydney, 28 May, 1885.

In view of a resolution of the City Council to construct a temporary water supply by pipes or flumes from the Nepean River near Penrith, I have the honor, by direction of the Right Worshipful the Mayor, to request that the Government will confer the necessary powers on the Council, or take such action in carrying out works in the above behalf, as the Government may deem fit to carry out the views of the Council in mitigating the severity of the present drought as it effects the residents of the city and suburbs.

I have, &c.,
HENRY J. DANIELS,
Pro Town Clerk.

No. 8.

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No. 8.

The Engineer-in-Chief to The Secretary, Gaslight Company.

My dear Sir, Harbours and Rivers Department, Sydney, 30 May, 1885.

In case of the Government requiring them, would you kindly let me know how many, if any, 18-inch pipes you could supply us with now, and say within the next two months.

Yours, &c.,
E. O. MORIARTY.

No. 8A.

The Engineer-in-Chief to The Under Secretary for Public Works.

Department of Public Works, Harbours and Rivers Branch, Sydney, June, 1885.

In view of the Government undertaking some temporary works for bringing the waters of the Nepean down to Sydney, I have made inquiry of the Gas Company as to their ability to supply us with some 3 feet pipes, of which we should require about 2,000 yards.

The company have most courteously and liberally offered to place that quantity at the disposal of the Government, at the price of £6 6s. per ton, which must be about their cost price to the company landed here.

If Mr. Secretary Wright approves of the company's offer being accepted, which I would recommend, the laying of the pipes might be commenced immediately.

E. O. MORIARTY.

Submitted.—J.R., 2/6/85. Approved.—Let me know what steps are to be taken in laying the pipes.—F.A.W., 3/6/85.

No. 9.

The Engineer-in-Chief to The Under Secretary for Public Works.

As Messrs. Hudson Bros. have taken considerable trouble in this matter, and have identified themselves with the project, I would beg to recommend that they be asked to give a price for removing the pipes to the sites where they will require to be placed, and laying and jointing them.

E.O.M.,
4/6/85.

Harbours and Rivers.—J.R., B.C., 4 June, 1885. Urgent.—B.C., Under Secretary, Public Works.

No. 9A.

The Engineeer-in-Chief to Messrs. Hudson Brothers.

Sir, Harbours and Rivers Department, Sydney, 10 June, 1885.

With reference to your offer to bring a temporary water supply into Sydney, I do myself the honor to ask, if you include in that offer, the cost of conveying the 36-inch pipes from where they now lie, to the sites where they are to be laid.

I have, &c.,
E. O. MORIARTY.

(Memo.—Hudson Bros. replied, the cost was not included in their offer. Letter not with papers.)

No. 10.

Mr. J. Y. Mills to The Minister for Works.

Sir, Sydney, 1 June, 1885.

During the past few days I visited the Pheasant's Nest and saw a stream of clear sparkling water from the Nepean and Cordeaux Rivers, as large as all streams in the various races at Botany put together, running to waste through the sluice of the dam. It was strong enough to leap over boulders 18 inches high.

In order to assist any one whom you may authorise in saving this and turning it into the Prospect Reservoir, which can now hold behind the finished portion of the dam nearly 70,000,000 gallons, and in a short time will hold 100,000,000, I will lend 400 men for a fortnight or 200 men for a month, with twenty-five horses and carts from the dam work, to help in constructing the only half-mile of temporary fluming required to complete the canal from the Pheasant's Nest to Prospect. I am also willing, if necessary, to pay one-third of their wages for the period named; this, with the 30-inch main connecting the canals above and below the dam, will complete the canal to within 2¼ miles of Granville Railway Station, a fact not generally known.

In our present distress such a storage of water at the nearest possible point to Sydney, and at an elevation of nearly 140 feet above sea level, would, I think, be a consolation to all concerned.

I have, &c.
J. Y. MILLS.

No. 11.

The Secretary, Gaslight Company, to The Engineer-in-Chief.

Australian Gaslight Company's Office, Sydney, 2 June, 1885.

Sir,

In reply to your letter of the 30th instant, I find we have no 18-inch pipes in stock; but in the "City of York," to arrive about the end of this month, we have 400 pipes, which the directors are willing to sell to the Government at £6 16s. 2d. per ton, if taken from the ship's side.

Please say at once whether you will take them, as it will be necessary for us to cable for a fresh supply to meet the urgent demands for gas, for which these were imported.

Referring to my letter of the 21st ultimo, respecting the 36-inch pipes offered to the Government, I am now in possession of Mr. Kinshela's (the contractor for laying our trunk main) letter expressing his willingness and consent to delay the execution of his contract for the purpose of aiding the Government in providing a water supply. In the meantime, however, he is using up these large pipes, and it will therefore be necessary for you, if you require them, to take the quantity offered at once.

Yours, &c.,
W. JOHNSTON,
Secretary.

No. 12.

Engineer-in-Chief's Memo.

If the Minister should decide on undertaking a temporary supply of water from the Nepean, I would beg to recommend the purchase of the within-mentioned pipes from the Gas Company.—E.O.M., 3/6/85.

No. 13.

Engineer-in-Chief to The Under Secretary for Public Works.

Harbours and Rivers Branch, Sydney, 29 May, 1885.

In reference to the proposal to provide a temporary water supply for Sydney, I would beg to suggest that the following cablegram be sent to the Agent-General:—"How soon could you procure and ship 5,000 tons, 18-inch pipes, ¾-inch thick."

E. O. MORIARTY.

Very urgent.

Submitted.—J.R., 29/5/85. Cablegram sent, 29/5/85. Approved.—F.A.W., 29/5/85. Mr. Moriarty.—J.R., B.C., 29/5/85.

No. 14.

Cablegram to Agent-General.

Department of Public Works, Sydney, 29 May, 1885.

Will the Principal Under Secretary please cause the following cablegram to be transmitted to the Agent-General, in London, viz.:—"How soon could you procure and ship 5,000 tons, 18-inch pipes, ¾-inch thick."

J.R.

The Principal Under Secretary, B.C., 29 May, 1885. See telegram, 29. Tel. to Agent-General, 30 May, 1885. The Under Secretary for Public Works.—J.B. (for P.U.S.), B.C., 30 May 1885. Harbours and Rivers.—J.R., B.C., 3 June, 1885.

No. 15.

Telegram from Agent-General to Colonial Secretary.

2 June, 1885.

Cochrane, Grove, and Company will supply five thousand tons, eighteen-inch pipes, in six months, at the rate of two hundred tons per week, price for an immediate order, four pounds, f.o.b. Middlesboro coated twelve feet lengths, London, seven shillings and six-pence extra.

Harbours and Rivers.—J.R., B.C., 4 June, 1885.

No. 15A.

The Engineer-in-Chief to The Secretary, Gaslight Company.

Harbours and Rivers Department, Sydney, 9 June, 1885.

Sir,

With reference to my telephone message to you of a few days ago intimating that the Minister for Works accepted your offer to supply 2,000 yards of 36-inch pipes, I now confirm the same, and at the same time, am to express the thanks of the Department for your generous offer.

I have, &c.,
E. O. MORIARTY.

No. 16.

No. 16.

Managing Director, Hudson Bros. (Limited), to The Secretary for Public Works.

B.

Sir,

Redfern Works, 4 June, 1885.

With reference to our several interviews respecting the construction of works necessary for a temporary supply of water to Sydney, in connection with the works already completed for the permanent supply from the Pheasant's Nest, on behalf of this Company I have now the honor to submit the following proposal:—

We will lay the 36" pipes you have secured from the Gas Company, across the several creeks necessary to connect the flow of water from the upper works above Prospect with the canal below Prospect, then convey the water in flumes (as proposed by the Engineer-in-Chief) to a spot known as Ettenger's, from thence to the proposed reservoir at Pott's Hill with the 36" pipes you have purchased from the Gas Company, and from the Pott's Hill reservoir by pipes 20 inches diameter, made of sheet iron, to the Botany Dams. These pipes we will supply and lay along the streets from Pott's Hill to Botany Dams, with the option of going through private property where it would be more convenient if we can get the consent of the property owners.

We will provide for carrying 3 million gallons per day in all the work we do, and will complete our contract in four months for the sum of sixty-five thousand pounds say (£65,000).

I have, &c.,

(for Hudson Brothers (Limited),

HENRY HUDSON,

Managing Director.

This is the tender or letter marked B referred to in our annexed bond to Her Majesty the Queen, dated on 3rd day of September, A.D. 1885.

Henry Hudson, Managing Director.
Fred. Thos. Humphrey.
Sam. W. Gray.
John Woods.
James C. Alexander.

Witness—
John Portus.

I recommend the adoption of this proposal of Messrs. Hudson Brothers to my honorable colleagues. —F.A.W., 9/6/85.

Cabinet having considered the highly important subject of water supply, and having consulted Mr. Moriarty and ascertained that this temporary mode of bringing the Pheasant's Nest Water Supply to Botany would not cause any interruption to the main works, and that if the temporary is not required for Sydney, owing to the breakage up of the drought, the upper portion of the proposed works can be utilized by helping to fill the permanent dam, decides that the offer of Messrs. Hudson Brothers (Limited) be accepted.—A.S., 8/6/85.

Mr. Moriarty will please make the necessary arrangements for carrying out the details of this work under a proper contract with the Messrs. Hudson Brothers.—F.A.W., 10/6/85. Harbours and Rivers, J.R., B.C., 10 June, 1885.

I suppose the Under Secretary has informed Messrs. Hudson Brothers of the acceptance by Government of their offer in this matter. I would request to be informed of the date of such acceptance in order that I may insert the time of completion in the contract which is now ready for signature.—E.O.M., 19/6/85. B.C., Under Secretary for Public Works.

There seems to have been no written acceptance; the matter was arranged verbally by the Minister, but the contract will now cover the whole matter, I presume.—E.O.M., 21/7/85.

No. 17.

Hudson Bros. (Limited) to The Engineer-in-Chief for Harbours and Rivers.

Granville, 20 June, 1885.

Be kind enough to supply us with reduced levels of B.M.'s along line of temporary water supply, more especially at present of that part of the line between 4 in 3,900 to 6 in 4,000; also, as soon as convenient, plan of the line.

(*pro* A. Chaplin.)
HUDSON BROS. (Limited).

Mr. Darley, for E.O.M.—J.B., 22/6/85. Urgent.

Herewith is a tracing in three sheets, showing the levels on each 100-feet peg from 4 miles 4,000 feet to 6 miles 3,000 feet, being the length proposed to be covered by a raised timber and iron flume. Messrs. Hudson Bros. should be instructed to keep the centre of this flume at least 30 feet clear of the centre line, as pegged out.—C.W.D., 22/6/85. Inform.

No. 18.

No. 18.

The Managing Director, Hudson Bros. (Limited), to The Secretary for Public Works.

C.

Sir, Redfern Works, Sydney, 13 July, 1885.

Referring to the inability of the Department to supply about 3 miles of 36-inch cast-iron pipes for which our contract for the temporary water supply provides, we desire to say that our company is willing to make the 30-inch wrought-iron pipes and substitute them for the deficient 36-inch cast-iron pipes, in terms of the contract, as now prepared by the Engineer-in-Chief for Harbours and Rivers, without asking for any additional payment; but it is to be distinctly understood that this extra work and material, involving, as it must, a cost of several thousand pounds, will only be incurred by us because we do not wish to embarrass you in any way with regard to this contract, and also to show we are determined to successfully carry through the undertaking entrusted by you to us.

We need hardly point out that this extra work coming upon us so unexpectedly, and so long after our offer was accepted, has entirely upset our calculations and business arrangements.

We therefore stipulate that should we on our part, from circumstances which we cannot control, be somewhat behind time in completing the contract, you will, on your part, in all fairness, show us some consideration, bearing in mind that we shall now have to procure from England 300 tons of wrought-iron plates of larger size and heavier gauge to those for which we cabled just a month ago.

We give you our assurance that every effort will be made to get the work done in time. The only impediment which threatens us is the possible delay in the execution of this further order for iron, which is not a stock size. We have cabled to our London Agents to spare no expense in procuring the iron promptly, and ship it by the fastest steamers on the berth.

I have, &c.,
for Hudson Bros. (Limited),
HENRY HUDSON,
Managing Director.

This is the letter marked C referred to in our annexed bond to Her Majesty the Queen, dated the 3rd day of September, A.D. 1885.

HENRY HUDSON,
Managing Director.

Witness—
John Portus.

FRED. THOS. HUMPHREY.
SAM. W. GRAY.
JOHN WOODS.
JAMES C. ALEXANDER.

Submitted.—J.R., 16/7/85. Place with other papers.—F.A.W., 18/7/85. Mr. Moriarty.—J.R., B.C., 18/7/85. Seen. Place with papers.—E.O.M., 30/7/85.

No. 19.

The Secretary for Public Works to Messrs. Hudson Brothers.

Dear Sir, Sydney, 15 July, 1885.

In reply to your letter of the 13th, I can only assure you in writing, as I did verbally, that in the matter of your contract you will receive every consideration and justice at my hands. I am aware of the extreme expense you have been put to, and fully appreciate your spirited enterprise in determining to push on with the work to its completion notwithstanding its increased cost to yourselves.

Believe me, &c.,
F. A. WRIGHT.

No. 20.

Minute from The Engineer-in-Chief to The Under Secretary for Public Works.

H. & R. Dep., 17–22/7/85.

Minute Paper.—Forwarding papers in connection with Messrs. Hudson Bros.' contract for the Temporary Water Supply for Sydney.

Enclosed will be found the specification and tender for Messrs. Hudson Bros.' (Limited) contract in connection with the temporary water supply for Sydney.

I suggest that these documents be forwarded to the Crown Solicitor, to enable him to prepare the necessary bond.

As the contract is somewhat of an unusual character it will probably require a special bond to meet the case.

In the specification reference is made to the peculiar features of the case, and an effort has been made to embrace them therein. The specification probably covers wider ground than the tender does, but this has been done advisedly, with the concurrence of the Messrs. Hudson.

I would suggest therefore that in the bond specific reference be made to that aspect of the case, viz., that the company are bound to carry out the work embraced in the specification, although it may not be held to be included in the tender; in other words, to give effect to the arrangement that wherein possibly the tender may be deficient the specification shall hold good, and *vice versâ*.

E. O. MORIARTY.

Submitted.—J.R., 23/7/85. Forwarded to Crown Solicitor, to prepare bond.—F.A.W., 25/7/85.

No. 21.

The Crown Solicitor to The Under Secretary for Public Works.

Sir, Crown Solicitor's Office, 28 July, 1885.

I have the honor to return herewith the papers relating to the contract with Messrs. Hudson Brothers for the temporary water supply for Sydney, and to request that you will inform me whether the specification was prepared after the tender of Messrs. Hudson Bros. had been accepted, the Messrs. Hudson agreeing to accept same as defining the work to be done under their contract, or, in the usual way, prior, to the tender being sent in; and if the former was the case, that you will also state to what description of the work to be done the tender was applicable if same was in any way stated.

I have, &c.,
JOHN WILLIAMS,
Crown Solicitor.

Submitted.—J.R., 29/7/85. Mr. Moriarty for report.—F.A.W., 29/7/85.

No. 22.

The Engineer-in-Chief to The Under Secretary for Public Works.

The tender, so far as I know, was never formally accepted in writing, but the specification was prepared after the verbal acceptance of the tender by the Minister. I have pointedly alluded to this in page 25 of the specification. The tender generally embraces the work to be done, but there are details in the specification which perhaps a strict reading of the tender would seem not to be included therein; hence my desire to make the specification the foundation of the bond rather than the tender.

E. O. MORIARTY,
4/8/85.

Submitted.—J.R, 5/8/85. Forwarded to Crown Solicitor.—F.A.W., 6/8/85.

No. 23.

Crown Solicitor to Under Secretary for Public Works.

Sir, Crown Solicitor's Office, Sydney, 10 August, 1885.

I have the honor to return herewith the papers relating to the contract with Messrs. Hudson Brothers for the temporary water supply for Sydney, and to request that I may be furnished with the plans and the names of the sureties.

I have, &c.,
JOHN WILLIAMS,
Crown Solicitor.

There are no plans. Hudson Bros. for names of sureties.—12/8/85.

No. 24.

The Under Secretary for Public Works to Messrs. Hudson Bros.

Gentlemen, Department of Public Works, Sydney, 12 August, 1885.

Referring to your contract for providing temporary water supply for Sydney, I am directed to request that you will have the goodness to furnish me with the names, &c., of the sureties you propose to join in your bond for the above contract.

I have, &c.,
JOHN RAE.

No. 25.

Hudson Bros. to The Under Secretary for Public Works.

Sir, Redfern Works, Sydney, 14 August, 1885.

In reply to your letter of the 12th instant, asking for the names of the sureties we propose to enter into the bond for the performance of our contract for the temporary water supply for Sydney, I have the honor to submit the names of John Woods, Esq., of Fairlight, Manly, and James Carnegie Alexander, Esq., of 31, Hunter-street.

I have, &c.,
HENRY HUDSON,
Managing Director, Hudson Bros. (Limited).

Submitted, 17/8/85. Mr. Moriarty for report.—J.R., B.C., 17/8/85. Sureties sufficient, there are no plans. M.P., 85/1564 should be placed with the contract documents.—E.O.M., 19/8/85. B.C., Under Secty. P. Works. Approved.—F.A.W., 21/8/85. Forwarded to Crown Solicitor, 21/8/85. Inform Mr. Hudson in terms of the above.—E.O.M., 24/6/85. Seen; plan received.—H.H., 24/6/85.

No. 26.

No. 26.

The Assistant Engineer to The Engineer-in-Chief.

Harbours and Rivers Office, Sydney, 20 August, 1885.

I RECOMMEND that the attached tracing be forwarded to Messrs. Hudson Bros. with a request that the 20-inch temporary pipe be kept at least 56 feet from peg No. 5, at Pott's Hill, so that it may be clear of works in connection with the filtering tank about to be erected. The tracing shows in outline the position and size of the tank.

I understand this portion of the pipe is already laid; if so, I think it can be easily moved by breaking one joint and rolling into a new trench.

C. W. DARLEY.

Inform Mr. Hudson accordingly.—E.O.M., 20/8/85. Mr. Hudson has taken the plan himself to-day.—J.B., 20/8/85. Let Mr. Blomfield see this.—J.B., 20/8/85. Seen.—H.A.B., 21/8/85. I visited this place to-day. Nothing has been done yet in the way of moving the temporary wooden tank or pipe.—H.A.B., 24/8/85. Let Mr. Darley see.—J.B., 25/8/85. Seen.—C.W.D., 25/8/85.

No. 27.

Messrs. Hudson Bros. to The Under Secretary for Public Works.

Redfern, 21 August, 1885.

Sir,

I have the honor to request you will be good enough to authorise the payment of £10,000 on account of the contract for the temporary water supply.

It may be urged that the bond is not yet signed, but I would beg to point out that I have called three times at the Crown Law Offices on the subject, and have been informed that the document is not yet ready. As we have paid away now about £20,000 on this work I shall be obliged if you will be good enough to authorise the advance now asked.

I have, &c.,
HENRY HUDSON.

I see no objection to this; has Mr. Moriarty any?—F.A.W., 24/8/85. J.R.—B.C., 24/8/85.

No. 28.

The Engineer-in-Chief to The Under Secretary for Public Works.

As I have inspected the works myself, I am glad to be able to recommend a compliance with this request. I presume Mr. Hudson will furnish me with a voucher in the usual way, and I should be glad to be informed to what fund the account is to be charged.—E.O.M., 25/8/85.

B.C., Under Secretary for Public Works.

Charge to £553,000 vote, further Sydney Water Supply, 1884, in anticipation of separate vote.—J.R., 27/8/85.

No. 29.

The Crown Solicitor to The Under Secretary for Public Works.

Crown Solicitor's Office, 25 August, 1885.

Sir,

I have the honor to inform you that in compliance with your instructions I have had prepared, and forward herewith, the bond for the completion of the Sydney Temporary Water Supply, in order that same may be perused by the Engineer-in-Chief for Harbours and Rivers, and, if approved of, executed by Hudson Brothers (Limited), and its sureties, and stamped, the amount of stamp duty payable being £1 2s. All the other papers herein are returned herewith.

I have, &c.,
JOHN WILLIAMS,
Crown Solicitor.

Mr. Moriarty.—J.R. B.C., 29/8/85.

Bond has now been signed and stamped, and is retained in my possession.—E. O. MORIARTY, 14/9/85.

B.C., Under Secretary for Public Works.

No. 30.

Messrs. Hudson Bros. to The Engineer-in-Chief.

Redfern Works, 8 September, 1885.

Sir,

I have the honor to request you will be good enough to certify for a further payment to this company of the sum of £10,000 on account of work completed in connection with our contract for the temporary water supply.

I have, &c.,
HENRY HUDSON,
Managing Director, HUDSON BROS. (Limited).

Mr. Darley for report, for E.O.M.—J.B., 8/9/85.

No. 31.

Report of The Assistant Engineer on Progress of Work.

FROM what I have seen I think work to the value of about £25,000 has been performed, but should not the vouchers be made out in the usual way with a deduction for percentage? I believe the Minister fixed the percentage at 25 per cent. to be held.

C.W.D.,
9/9/85.

No. 32.

The Assistant Engineer to The Engineer-in-Chief.

I FIND that about fourty-two more 12-feet lengths of 36-in. pipes are required to close the aqueducts, and as the Gas Company are unable to supply any more, I recommend that Messrs. Hudson Bros. (Limited) be requested to furnish a price for making them of wrought-iron.

About 504 feet will be required exclusive of joint laps.

Messrs. Hudson Bros. (Limited) should also be instructed to provide sufficient 30-in. pipe to close up the gap of 1,200 feet across the Duck Creek, which was to have been laid with cast-iron pipes, but as these cannot now be obtained from the Gas Company the wrought-iron pipes had better be made.

C. W. DARLEY,
24/9/85.

Inform Messrs. Hudson Bros. and request them to forward a price for the pipes.—E.O.M., 24/9/85.

No. 33.

The Engineer-in-Chief to Messrs. Hudson Bros.

Gentlemen, Harbours and Rivers, 25 September, 1885.

I shall be glad if you would kindly furnish me at your earliest convenience with a price for, say, 504 feet exclusive of joint laps of 36-inch wrought-iron pipes sufficient to close the aqueducts in connection with the temporary water supply.

I have also to request that you will provide sufficient 30-in. wrought-iron pipes to close up the gap of 1,200 feet across Duck River.

I have, &c.
(for E. O. MORIARTY),
J. BARLING.

No. 34.

Messrs. Hudson Bros. to The Engineer-in-Chief.

Sir, Redfern, 30 September, 1885.

In reply to your letter, dated the 30th instant, asking for a price for the remainder of the 36-inch pipes required to close the aqueducts in connection with the temporary water supply, I beg to say we are prepared to supply these pipes, delivered on trucks in our siding, for twenty-four shillings (24s.) per lineal foot.

I have, &c.,
(For HUDSON BROS.),
HENRY HUDSON,
Managing Director.

The price quoted, 24s. per foot, is, I think, rather high, being in excess of the cost of the cast-iron pipes. The latter cost just 22s. per foot, and I believe Messrs. Hudson Bros. will accept the rate under the circumstances if written to offering it, the order to proceed with the work might at the same time be given.—C.W.D., 7/10/85.

The Engineer-in-Chief, Harbours and Rivers. Write to Messrs. Hudson Bros. offering 22s. per foot run.—E.O.M., 7/10/85. Write at once.—J.B., 8/10/85.

No. 35.

The Engineer-in-Chief to Messrs. Hudson Bros.

Gentlemen, Harbours and Rivers, 8 October, 1885.

With reference to your letter of the 30th ultimo, offering to supply the remainder of the 36-inch pipes required to close the aqueducts at the rate of twenty-four shillings (24s.) per lineal foot, I beg to inform you that I am prepared to recommend that twenty-two shillings (22s) per lineal foot be paid for the pipes.

If you are disposed to supply them at this rate please let us know at once.

I have, &c.,
(for E. O. MORIARTY),
J. BARLING.

No. 36.

Messrs. Hudson Bros. to The Engineer-in-Chief.

Sir, Redfern, 12 October, 1885.

I have the honor to acknowledge receipt of your letter of 8th October, stating that you consider 24s. per lineal foot for the 36-inch pipes rather high, but that you are prepared to recommend 22s. per lineal foot being paid for same. As we are very anxious to get the work in hand, we are willing to accept 22s. per lineal foot as proposed by you.

We

We will use every effort to get these pipes made promptly, and feel sure we receive some consideration as regards time for the extra work entailed in making these pipes, as well as the 1,200 feet for Duck River.

I have, &c.,
(for HUDSON BROS., (Limited),
HENRY HUDSON,
Managing Director.

Carry out.—E.O.M., 13/10/85. Accept, done.—J.B., 11/10/85. Messrs. C.S. to note,—J.B., 14/10/85. Noted.—J.C., 15/10/85. S.S., 1/910/85.

No. 37.

The Engineer-in-Chief to Messrs. Hudson Bros.

Gentlemen, Harbours and Rivers Department, Sydney, 14 October, 1885.

I do myself the honor to accept the offer contained in your letter of the 12th instant to supply the 36-inch pipes required to close the aqueducts at the rate of twenty-two shillings (22s) per lineal foot.

I have to ask you to be good enough to have the work put in hand at once.

I have, &c.,
(for E. O. MORIARTY),
J. BARLING.

The work completed comprises four of the aqueducts, 2 miles of timber flumings, 3 miles of 22-inch pipe laid, and 1 mile of 22-inch pipe made ready for laying.—C.W.D.

See voucher 4013, September, 1885, for £8,750.—S.S., 10/9/85.

No. 38.

The District Engineer to The Engineer-in-Chief.

Sir, Sydney Water Supply, Campbelltown, 1 October, 1885.

In accordance with your memorandum, received on the 23rd ultimo, I have the honor to report that your instructions regarding the laying of pipes were forwarded to Messrs. Hudson Bros. on the 24th ultimo.

Previously, written instructions on the same subject were given on the 18th July, 31st August, 11th September, and 18th September.

In addition I have constantly given verbal instructions to the same effect, and cautioned them against deviating from the plans and specifications.

Although Messrs. Hudson Bros. promised to attend to these instructions they practically disregarded them, and instead of the work complained of being rectified it is being completed, and new work is being done in an equally unsatisfactory manner.

In many places the pipes are being laid almost on bed-level and close to sides of cutting, and even where walling has to be built.

The concrete dams being constructed across the canal are in some places insufficiently high and very thin, and although some of the concrete used is now in three weeks it is still quite soft, and does not appear to be setting.

The timber work is not altogether satisfactory either on account of bad joints, omission of bolts, and pipes not resting on bearers, &c.

I should, therefore, be greatly obliged if you would take an early opportunity of satisfying yourself as to the correctness of my report, and of dealing with the matter accordingly.

I have, &c.,
J. GRIMSHAW,
Res. Eng.

No. 39.

The District Engineer to The Engineer-in-Chief.

As the Engineer-in-Chief passed over the upper portion of work (September 30) and saw its condition, it would perhaps be better if Hudson Bros. received notice direct from head office, to which they will probably then attend.

D.H.,
3/10/85.

B.C., Engineer-in-Chief.

No. 40.

The Assistant Engineer to The Engineer-in-Chief.

I THINK Hudson Bros., attention should be called to this matter at once, they have been repeatedly spoken to and requested to keep the pipes at least 18 inches off the bottom as well as clear out from the walls. It will be a difficult matter for the contractor to lay the concrete floor under the pipes hereafter if they are not properly kept up, therefore the firm should be called upon to raise them at once to the height specified.

C.W.D.,
7/10/85.

No. 41.

No. 41.

The Engineer-in-Chief respecting Works.

I saw the matters complained of myself. Send a copy of this letter to Messrs. Hudson Bros. and request their attention to the immediate rectifying of the matter complained of.

E.O.M.,
7/10/85.

No. 42.

The Engineer-in-Chief respecting Works.

Harbours and Rivers, Sydney, 7 October, 1885.

I was over the upper portion of the ravine aqueducts the other day, and was much surprised at the very slop manner in which the work was being carried out, in some instances the pipes having drawn quite out of the joints, pulling the lead with them. In fact, most of the joints were unsatisfactory. Call Mr. Hudson's attention to the matter. E.O.M.

Mr. Barling,—Write at once.—J.B., 7/10/85.

No. 43.

The Engineer-in-Chief to Messrs. Hudson Bros.

Gentlemen, Harbours and Rivers Department, Sydney, 7 October, 1885.

I have to call your attention to the very slop manner in which the work at the various aqueducts is being carried out.

In some instances the pipes have drawn quite out of the joints, pulling the lead with them; in fact, most of the joints are unsatisfactory.

I must, therefore, request you to rectify these matters at once.

I have, &c.,
E. O. MORIARTY.

No. 44.

The Assistant Engineer to The Engineer-in-Chief.

I recommend that the plan herewith showing the screen required in the canal above Simpson's Creek be forwarded to Messrs. Hudson Bros. (Limited), with a request that they have the screen constructed and erected in place in the canal about 10 feet in advance of the 36-inch pipe.

C. W. DARLEY,
12/10/85.

The Engineer-in-Chief, Harbours and Rivers. Write at once.—J.B., 12/10/85. E.O.M., 13/10/85.

No. 45.

The Engineer-in-Chief to Messrs. Hudson Bros.

Gentlemen, Harbours and Rivers Department, 13 October, 1885.

I beg to forward herewith a plan showing the screen required in the canal above Simpson's Creek, and to request that you will have the screen constructed and erected in place on the canal, about ten (10) feet in advance of the 36-inch pipes.

I have, &c.,
E. O. MORIARTY.

No. 45a.

The Engineer-in-Chief to Messrs. Hudson Bros.

Gentlemen, Harbours and Rivers Department, Sydney, 13 October, 1885.

I beg to forward herewith a plan showing the screen required in the canal above Simpson's Creek, and to request that you will have the screen constructed and erected in place in the canal, about 10 feet in advance of the 36-inch pipes.

I have, &c.,
E. O. MORIARTY.

No. 46.

Messrs. Hudson Bros. to The Engineer-in-Chief.

Sir, Redfern Works, Sydney, 31 October, 1885.

I have the honor to report that our contract for the temporary water supply is completed, with the exception of twenty-four pipes (about 450 feet) to be laid between Ettinger's and Pott's Hill, and the laying of the pipes across the Nepean and Menangle Creeks.

You

You will remember that we have made 1,200 feet of 30-inch pipes for the Duck River section, and between 500 and 600 feet of 36-inch pipes for the Nepean and Menangle Creeks, in addition to the work that we contracted to have completed to date, so that we may fairly claim that we have not exceeded our contract time.

I have the honor to inform you that the twenty-four pipes in the Duck River section will be laid on Monday, November 2nd, and the whole of the work, from the canal at Sherwood Heights to Botany, will then be completed.

I expect the pipes will be laid across the Menangle and Nepean Creeks by Saturday, November 7th. I have this day inspected the work across the various creeks above Campbelltown, and have the honor to report that the water has been through the pipes crossing Simpson's Creek, Elladale Creek, and Ousdale Creek. The water was turned off on Friday, October 30th, to enable us to fix the screen, recently ordered by you, in the canal at Simpson's Creek. That work was completed to-day, and the water again turned on to scour the canal between Ousdale and Mullaly's Creek; and I have every confidence that the pipes will be laid across the Nepean and Menangle Creeks by the time the canal is scoured up to them.

I have, &c.,
HENRY HUDSON.

No. 47.

The Auditor General to The Engineer-in-Chief.

Department of Audit, 15 October, 1885.

Treasury payments—28th August, 10th September last, and 2nd instant.

EXPLANATION is requested as to why the payments of £10,000, £8,750, and £15,750, advances on account of Hudson Brothers special contract for temporary supply of water to Sydney, have been marked as payable out of the loan vote of £553,000, under Loan Act 48 Vic. No. 26. That Act was passed on 1st November, 1884, and the vote referred to is considered applicable only to the works then in progress.

E. A. RENNIE.

Papers on this subject attached (see No. 28).—For E.O.M., J.B., 6/11/85. B.C., Auditor General.

No. 48.

The Auditor General to The Engineer-in-Chief.

THERE is is no alternative but to disallow these payments. Treasury must be informed.

E.A.R.

Treasury informed of the disallowance.—G.H., 13/11/85.

To be returned. There is no alternative but to disallow the payments as charged, and the Treasury have been informed to that effect; a subsequent payment has also been disallowed. £10,500.—E.A.R.

The Engineer-in-Chief, Harbours and Rivers, 13/11/85.

No. 49.

The Engineer-in-Chief to The District Engineer.

Copy of instructions sent to Mr. District Engineer Howison on M.P., H. & R., 85/2,410, *re* Messrs. Hudson Bros. (Limited), providing maintenance men on their contract.

I VISITED five or six of the creek crossings with Mr. Howison and Mr. Grimshaw last Saturday. I did not observe anything of too temporary a nature, nor did Mr. Grimshaw call my attention to any of the defects referred to in this report.

C.W.D., 11/11/85.

I think it will be sufficient if Mr. Grimshaw reports from time to time, during the period of maintenance, if anything should go wrong with the temporary works.—E.O.M., 12/11/85. B.C., Mr. Howison.

No. 50.

Bond.

Messrs. Hudson Brothers (Limited), and sureties to Her Majesty the Queen.

Dated 3rd September, 1885.

KNOW all men by these presents that Hudson Brothers (Limited) of Sydney in the Colony of New South Wales a Company registered under the provisions of the Companies Act John Woods of Manly in the Colony aforesaid Esquire and James Carnagie Alexander of Sydney aforesaid Esquire are jointly and severally held and firmly bound unto Her Most Gracious Majesty Queen Victoria in the penal sum of six thousand pounds sterling to be paid to Her said Majesty her heirs or successors for which payment well and truly to be made Hudson Brothers (Limited) aforesaid binds itself and its assigns and we the said John Woods and James Carnagie Alexander binds ourselves and each of us and each and every of our heirs executors and administrators jointly and severally firmly by these presents In witness whereof Hudson Brothers (Limited) aforesaid hath caused its common seal to be affixed hereto and the said John Woods and James Carnagie Alexander have hereunto set their hands and seals this third day of September in the year of our Lord one thousand eight hundred and eighty-five Whereas Hudson Brothers (Limited) aforesaid have agreed with the Honorable the Minister for Works acting on behalf of the Government of the said Colony

Colony to find and provide all the materials tools plant labour and every other thing requisite and necessary for and to do and perform the various works required in and about the full and proper construction erection and completion of the works required for bringing in a supply of water from the Nepean and Cataract Rivers in the said Colony as a temporary water supply for Sydney and delivering the same into No. 6 or No. 4 dam near Sydney at or about the part where the Gardener's Road intersects it according to the specification hereto annexed marked A the tender or letter of Hudson Brothers (Limited) of date 4th June last hereto annexed marked B and the letter of Hudson Brothers (Limited) of date 13th July last hereto annexed and marked C and under and in accordance with the general conditions hereto annexed and marked D at or for the price or sum of sixty-five thousand pounds mentioned in the said tender or letter of date 4th June it being understood and agreed between Hudson Brothers (Limited) and the Secretary of Works on behalf of the Government of the said Colony that the works to be done by Hudson Brothers (Limited) are those set out and mentioned in the said specification and the said two several letters or any one of them that is to say the whole of the works mentioned in the specification though some or some portion thereof is not included or referred to in either of the said letters and the whole of the works mentioned and referred to in the said letters or either of them although the same or some portion thereof is not mentioned in the said specification and also under and in accordance with the said general conditions hereunto annexed and are marked D at or for the said sum of sixty-five thousand pounds And that Hudson Brothers (Limited) shall complete and perfect the whole of the said works on or before the thirty-first day of October one thousand eight hundred and eighty-five And whereas the Secretary of Works on behalf of the Government of the said Colony agreed with Hudson Brothers (Limited) as aforesaid upon condition also that Hudson Brothers (Limited) with two sufficient sureties should enter into a bond to Her Majesty in the penal sum of six thousand pounds conditional to secure the due completion of the said works and the proper carrying out of the said contract and the above-bounden John Woods and James Carnagie Alexander have severally offered to become and be bound to Her Majesty her heirs and successors as such sureties for the due performance and completion of the said works within the time hereinbefore mentioned in that behalf and according to terms and conditions of the said specification and the said two several letters and under the said general conditions Now the condition of the above written bond and obligation is such that if Hudson Brothers (Limited) aforesaid do and shall well and truly provide the materials tools plant labour and every other thing requisite and necessary for and do and shall erect complete and finish the said works in the said specification or in the said letters or either of them mentioned as hereinbefore is stated in accordance in all things with the terms and conditions of the said specification and the said two several letters and under and in accordance with the said general conditions and within the time in that behalf hereinbefore mentioned then this obligation will be void and of non-effect otherwise to remain in full force and virtue.

The Common Seal of Hudson Brothers (Limited) aforesaid was affixed hereto at a meeting of the Board of Directors of the said Company by HENRY HUDSON Managing Director FRED. THOS. HUMPHERY SAM. W. GRAY Directors of the said Company in the presence of— JOHN PORTUS. (L.S.)

Signed sealed and delivered by the said JOHN WOODS in the presence of— JOHN PORTUS. JOHN WOODS.

Signed sealed and delivered the said JAMES CARNAGIE ALEXANDER in the presence of— JOHN PORTUS. JAMES C. ALEXANDER.

No. 51.

Specification of Temporary Water Supply.

A.

DESCRIPTION of work to be done in connection with bringing a supply of water from the Nepean and Cataract Rivers, and delivering the same in No. 6 dam, at or about the point where the Gardener's Road intersects it.

ABOVE PROSPECT RESERVOIR.

THE work to be done above Prospect Reservoir consists in lying 36-inch pipes across nine openings, viz. :— Eight across creeks known as Simpson's, Elladale, Ousdale, Mullaly, Leaf's, Nepean, Woodhouse's, and Menangle, and one over the railway cutting between Campbelltown and Menangle.

The 36-inch pipes for this work will be found by the Government, and delivered in sufficient numbers on either bank of each of the crossings. The contractor must then take delivery, and lay them across from the finished portion of the canal on one side to the finished portion on the other side; but the Government shall not be held responsible for any delay in the delivery of the pipes.

The contractor will be held responsible for the safety of all the pipes after they are delivered on the ground, and must, at his own expense, replace any that may become broken in any way.

The pipes shall be laid a short distance down the centre of the canal, and turned out through a cutting to be made by the contractor, and be carried as shown on plans either above or below the canal line, and parallel with it, but clear of works that may be necessary to be hereafter constructed in connection with the erection of the permanent tubes. When the pipes are laid, suitable dams of concrete or brick shall be constructed in an approved manner on the upper side across the finished portion of the canal, so as to raise the water and give it a sufficient head to pass through the pipes; a similar dam shall be constructed across the canal at the outlet end of the pipe to retain the water.

The contractor shall perform all excavation, whether in earth or rock, necessary for passing the 36-inch pipes out of the canal and across the several gullies, &c., the cost of all such excavation being included in the contract lump sum.

The

The pipes may be laid as an inverted syphon down the slopes, but must in all cases be carried on timber trestles well above flood-level. So long as the pipes are clear of flood-level the contractor may elect what height he finds most convenient to construct the timber trestle-work, but it must be understood that should any bends be required other than the two at each end necessary for leading the pipe out of the canal all such extra bends must be supplied and paid for by the contractor.

The pipes crossing over the railway beyond Campbelltown shall be carried on a level from abutment to abutment; and for this purpose a substantial timber trestle bridge must be constructed in accordance with the special design prepared for the work, which provides for the pipes being laid in a manner that will not interfere with the erection of the permanent aqueduct pipes hereafter.

The posts or uprights must be Oregon pine 12 × 12, properly framed in sills, with headstocks and all necessary bracing complete.

Corbels and girders, 12 × 12, shall be laid across and properly secured to span the openings. The supports must be erected to clear the railway as well as to be clear of the site of the piers for the permanent aqueduct.

The 8-feet openings in the abutment through which the 36-inch pipes are to pass must be closed up with T and G pine planks, 3 inches thick, securely bolted to the flanges and sufficiently braced and stiffened to make the ends strong and watertight.

The pipes must be cleaned out and properly jointed in a suitable manner; but, so long as the work is substantially done and the joints are made watertight under the full pressure, lead need not necessarily be used, as caulking with Europe strands or with sawn wood wedges, or both combined, will probably be found sufficient.

At the above and all other railway crossings where the flumes, pipes, or other works cross or lie near to or within railway premises the contractor must obtain permission of the Commissioner for Railways or his properly authorized officer to enter upon the same, before interfering with any works or land connected with the railways, and at all times he shall carry out any instructions he is given with a view to the safe working of the railways.

The contractor will be held wholly responsible for any accident or delay that may occur to the railways through the execution of the works in connection with the Temporary Water Supply.

The works below Prospect consist in the construction of open fluming from the present canal end, viz., from 4 miles 4,000 feet to a point known as Ettinger's, at 6 miles 3,000 feet below Prospect, a distance of 1 mile and 4,280 feet, crossing the Great Southern Railway on its way.

From Ettinger's to Potts' Hill, viz., 6 miles 3,000 feet, to 9 miles 3,500 feet, a distance of about 3 miles 500 feet, an inverted syphon pipe, 30 inches internal diameter, must be constructed and laid, except for a distance of about 1,200 feet along the lowest portion of the valley where the pipe line crosses the Duck Creek. For this portion of the line 36-inch pipes will be supplied and delivered by the Government, and must be laid and jointed as before specified.

From Potts' Hill to No. 6 dam at Botany, wrought iron pipes not less than 20 inches internal diameter must be constructed and laid—the length of the pipes being about 12 miles.

Flumes:—The flumes between 4 miles 4,000 feet and 6 miles 3,000 feet will be constructed on trestle-work, in accordance with the general design prepared for the work. The waterway shall be formed of galvanized corrugated sheet iron of 26 gauge, riveted together, and curved to a segment of a circle, providing a water-way 5 feet wide and 2 feet deep, and laid throughout the whole distance with a falling gradient of 6 inches to a mile.

The riveting of the sheets together must be done in a workmanlike manner so as to make them perfectly water-tight. The seams shall then be payed over with hot asphalt composition, or otherwise treated to make them water-tight.

Where the flume commences it must be connected in an approved manner with the waterway of the canal, so that it will not interfere with the carrying on to completion of the permanent pipe head basin. For this purpose the flumes will have to start from one side of the canal, at such distance back as the state of the works on Contract No. 21 may necessitate, and a suitable dam constructed across the canal to raise and direct the water into the flume.

Special care must be taken to ensure the stability of the trestle-work, &c., at the crossing of the Great Southern Railway, as before mentioned. This work must be carried out in such a manner as may be approved of by the railway authorities.

Pipe-head Tank.—A suitable receiving-tank must be constructed at the end of the flume to form a pipe-head. This tank should be about 10 or 12 feet square, constructed of timber, with its sides up to the level of the top of the flume, and the bottom should be at least 4 feet below the bottom of the pipe-outlet, so as to form a trap to arrest stones or other obstructions from passing into the pipe. A suitable 9-inch wash-out pipe and valve must lead from the bottom of the tank to drain off the water and clean the tank where necessary, and a proper escape for the water must be provided.

30-*inch Pipe*.—This pipe shall be constructed of sheet-iron, with properly riveted seams; the thickness of the iron may vary in proportion with the head on the pipe at the higher levels. It may be No. 16 gauge, increasing to No. 11 gauge at the lowest levels, where the maximum pressure will be about 50 lbs per square inch.

The curving, jointing, and riveting must be carefully carried out to ensure a perfectly watertight pipe.

Air-valves.—On the summit of all rises, no matter how small, suitable air-valves or air-cocks must be provided and fixed to allow for the escape of the air when filling the pipes, and to enable the air which will collect in the pipe being drawn off from time to time.

Sludge-valve.—At the bottom of the syphon near Duck Creek a 9-inch branch scour-pipe and valve must be provided and fixed for scouring out the pipe from time to time.

Balance Tank.—On Potts' Hill, where the 30-inch pipe ends, another tank about 8 feet × 8 feet must be constructed, to form a balance-head for the 20-inch pipe. The sides of this tank must be carried up to R.L. 171·00, being the level of the surface of the water at the end of the open flume.

36-*inch Pipe*.—As before mentioned, the Government will provide and deliver about 1,200 feet of 36-inch pipes across the depression through which the Duck River flows, which the contractor must lay and joint as before specified. Suitable diminishing pieces must be provided by the contractor to connect the 30-inch and 36-inch pipes at each end, the whole being jointed up and made perfectly water-tight in a workmanlike manner.

Bridge

Bridge over Duck River.—A suitable trestle bridge must be constructed across Duck River to safely carry the 36-inch pipes above flood-level in the creek.

Crossing Roads.—Where the 30-inch and 36-inch pipe lines cross the roads the pipes must be buried sufficiently deep to allow at least 2½ feet cover over the top of the pipe. Along other portions of the line from Ettinger's to Potts' Hill the pipes may be laid on the surface of the ground. Suitable crossings must however be provided where necessary for crossing traffic over the pipes, either by burying them as above specified or by enclosing them within a timber case and raising approaches on either side.

20-inch Pipe.—From Potts' Hill to No. 6 dam at Botany the water will be conveyed through riveted wrought-iron pipes of not less than 20 inches diameter. These pipes will commence at the balance tank on Potts' Hill previously referred to, and shall follow the land resumed for the permanent pipe line as far as the Liverpool Road, thence keeping on or near that road as far as its junction with Milton-street, Ashfield. The pipes will then lead along the following streets, viz.:—Milton-street, Arthur-street, Victoria-street, Robert-street, Prospect Road, William-street, Henson-street, James-street, across Old Canterbury Road, and thence *via* Gamline Road, New Canterbury Road, Marrickville Road, Unwin's Bridge Road, Boundary Line, Cook's River Road, and finally reaching the Gardener's Road shall follow it to the No. 6 Dam.

This route may however be varied if found necessary to obtain better or sufficient gradients.

The 20-inch pipe may be formed with 16 gauge sheet-iron, single riveted throughout, the rivets being about ¾-inch pitch, or closer if found necessary, to secure a perfectly water-tight pipe. It shall be put together stove-pipe fashion, and securely riveted. All seams to be payed over with hot asphalt composition of approved quality.

From Potts' Hill to the Liverpool Road the pipe may be laid along the surface, but passing under all roads as before specified for the 30-inch pipes, and all necessary accommodation crossings shall be provided in an approved manner.

From the Liverpool Road to Botany the pipe shall be wholly buried below the surface, with at least 18-inch cover; but where the line crosses a branch road it must have at least 2½ feet cover, to protect the crown of the pipe from crushing in. If found necessary, the contractor must lay sleepers and a plank covering over the pipes to protect them from wheel traffic.

When the contractor breaks up the surface of roads to lay the pipe he must make good the formation again to the approval of the authorities in charge of the various roads affected, and maintain the roadway immediately over the pipe trenches in good order for a period of six (6) months from the date of completion of the laying of the pipes.

Drainage.—Care must be taken in laying the pipes that the work shall be done in such a manner as not to interfere with the natural drainage passing along or under the roads. Where the line crosses creeks, such as Bark Huts, Long Cove, Halligan's, or Shea's Creeks, sufficient staying or supports must be erected to carry the pipe safely across over flood-level.

Air-valves.—Suitable air-valves shall be inserted in the pipe at the crown of all summits along the whole length of the pipe line, to permit of the free discharge of the air. These valves shall be in all cases covered over with suitable surface-boxes, so as to be at all times readily accessible.

Sludge-valves.—At least three 9-inch branch pipes fitted with approved valves shall be provided and fixed to the pipes, in depressions at points to be hereafter decided upon, for the purpose of cleaning out the pipes from time to time.

The contractor will be held wholly responsible for all claims that may be made for injury to adjacent properties during the execution of these works; and when the pipe is laid along or across streets or roads, the authorities, municipal or other, in charge of the said roads or streets, must be notified thereof by the contractor, who shall carry out all repairs and maintenance to their satisfaction, and the contractor shall carry out the works in the various Municipalities, as regards lights, hoardings, &c., necessary for protection of life and prevention of accidents, in strict accordance with the by-laws of each Municipality or directions of the proper officers.

The work shall be carried throughout in a substantial manner, to the satisfaction of the Engineer-in-Chief for Harbours and Rivers.

Notwithstanding the specification herein of anything to the contrary, the dimensions and gradients at all parts must be made sufficient to deliver the minimum quantity of 3,000,000 gallons per day into the Botany dams, the contractor being wholly responsible in this respect.

The Government reserves the right to cancel the contract at any time by giving notice to that effect in writing; and such compensation as may be mutually agreed upon between the Engineer-in-Chief and the contractor, will be forthwith paid to the contractor; but failing a satisfactory settlement as to the compensation to be allowed, the matter shall be decided by arbitration, each party to the contract naming an arbitrator and binding themselves to abide by the award; but should the two arbitrators so appointed fail to agree, they shall mutually appoint an umpire, whose decision shall be final and binding upon all parties concerned.

It shall be distinctly understood that the contractor shall be wholly responsible for the efficient carrying out of this contract, that is to say, if it is found necessary by the Engineer-in-Chief during the progress of the works, to substitute material and labour of a higher and more expensive class than is herein specified, such labour and material shall be supplied by the contractor, for which he shall have no extra claim.

It being also to be understood that any deviation from the contract which shall be judged advisable by the Engineer-in-Chief shall be carried out, and shall not on any pretence entitle the contractor to any extra payment, the lump sum of £65,000 being held to include any and every such deviation or alteration in the work.

The Engineer-in-Chief shall also have full power to direct the order in which the various parts of the work shall be carried out, and shall, if he see fit, order the stoppage for a time of any or all parts of the work, without prejudice to this contract, or giving the contractor a claim for demurrage. And in the event of such stoppage, the contractor shall only be entitled to an extension of time equivalent to the duration of such stoppage or stoppages.

In the event of any exceptionally bad weather, the Engineer-in-Chief at his discretion shall have power to grant such extension of time as he may think just and fair under the circumstances, and from his decision in this respect there shall be no appeal.

It shall be understood that the General Conditions attached hereto shall only hold good so far as they are not repugnant to the terms of this specification.

As the work comprised in this contract has been let under exceptional circumstances to Messrs. Hudson Brothers (Limited), and upon a written undertaking given by them previously to this specification having been prepared, and in the absence of the usual detailed plans, surveys, &c., it is distinctly to be understood it is not pretended that herein is specified every detail of the work to be performed. Everything necessary however for the accomplishment of the required result in a substantial and workmanlike manner to the satisfaction of the Engineer-in-Chief for Harbours and Rivers shall be done or supplied whether the same be specified or not; and the contractors shall have no ground of action, either in law or equity, on the plea that any work ordered by the Engineer-in-Chief to be done or material supplied was not included in the specification or intended to be employed by them in the execution of their contract; and in the event of any such work and material being performed or supplied it shall be considered the same as if specifically provided for in this contract, and the cost thereof shall be regarded as included in the contract sum of £65,000, and the execution or supply thereof shall not entitle the contractors to any extra amount over that sum on any pretence whatever.

And the contractors on their part by their signature hereto expressly acknowledge their full liability under these terms after having carefully read and considered the same.

In addition to the fines leviable under this contract in the event of the work not being done within the contract time, the following additional fines shall be imposed on the contractors and be payable to Her Majesty should the works not be found of sufficient capacity to deliver the full quantity of water contracted to be so delivered at the No. 6 dam at Botany (that is to say, 3,000,000 gallons per diem), viz., at the rate of £5,000 for every 500,000 gallons or part thereof which the said works shall deliver short of the stipulated quantity (viz., 3,000,000 gallons in each twenty-four hours) in the said dam at Botany.

The contractors therefore, in view of their liability to this fine, shall have full liberty, if they think it necessary so to do, to increase the delivering capacity of any or all parts of these works. But in the event of their doing so they shall not on that or any account be entitled to claim any extra amount over the contract sum of £65,000; neither shall they be entitled to plead in mitigation, in the event of the full quantity not being deliverable, that the works as specified herein were not capable of delivering the full quantity stipulated, viz., 3,000,000 gallons per diem of twenty-four hours, it being understood that the contractors accept all and every responsibility on this and every other score in connection with this contract.

E. O. MORIARTY.

This is the specification marked "A," referred to in our annexed Bond to Her Majesty the Queen, dated the 3rd day of September, A.D. 1885.

HENRY HUDSON, Managing Director.
FRED THOS. HUMPHERY.
SAMUEL W. GRAY.
JOHN WOODS.
JAMES ALEXANDER.

Witness—JOHN PORTUS.

GENERAL CONDITIONS.

Interpretation clause.

1. The words "Superintending Officer" in these conditions shall mean any person who may from time to time be appointed by the Engineer-in-Chief for Harbours and Rivers to supervise the works or buildings, and the words "Engineer-in-Chief" or "Engineer" shall mean the Engineer-in-Chief for Harbours and Rivers for the time being. The words "Minister for Works" shall mean the Secretary for Works for the time being. The word "Government" (where used) to mean the Government of New South Wales promoting this undertaking. The word "Schedule" to mean the adjusted Schedule of prices settled by the Engineer and contractor previous to commencing the work. Words importing the singular number only shall include the plural number, and words importing the plural number only shall include the singular number.

Dismissal of Workmen, removal of improper materials, &c.

2. The Engineer-in-Chief shall have the power of immediately dismissing any agent or workman employed by the contractor, and of having removed off the works any materials, plant, or implements which in his opinion are insufficient for the purpose intended, or at variance with the meaning and intention of this specification; and the cost of the removal of any such plant, materials, or implements shall be paid by the contractor.

Instructions to be obeyed.

3. Should the contractor refuse or neglect to carry out the instructions of the Engineer or the Superintending Officer, the Engineer shall have the power of suspending the usual monthly certificate until such instructions have been complied with.

Drawings, specifications, &c.

4. The plans, sections, and drawings represent generally the form and dimensions of the several works. Where any discrepancy exists between the dimensions as indicated by the scale and those marked in figures, the figures are to be considered as correct, and are to be taken in all cases in preference to the measurements by the scale attached; and if there should be any discrepancy between the figures or dimensions, or the form of construction, or the material as indicated in the drawings, and the dimensions, form of construction, and materials given in the specifications, the directions of the specification shall be adopted; and in all cases of defective description or any ambiguity, the explanation given by the Engineer shall be binding upon the contractor. Also, anything contained in the drawings and not in the specification, or anything contained in the specification and not shown in the drawings, shall be equally binding as if it were contained in both.

Extra

Extra works, omissions of works, &c.

5. If at any time whilst the works are in hand it shall be deemed expedient by the Engineer to order material or work of a different description to that specified or to increase or diminish the dimensions or extent of any works to be done under this contract, or to alter their situation or to vary the form or dimensions of any of the said works, or of any part thereof, or to substitute one class of work for another, he shall have full power to do so, and to order and direct any such increase, diminution, alteration, or substitution, which shall be executed by the contractor, and if of the class of works provided for in the schedule of prices, at such schedule prices; and no such increase, diminution, alteration, or substitution of works shall in any way annul or set aside this contract, or extend the time for the completion thereof, unless the Minister for Works shall see fit to grant such extension, but such additions or alterations shall be measured and allowed and paid for, or deducted from the contractor's account, as the case may require, according to the schedule of prices. Provided that if any portion of the works so ordered to be done shall not be of the class of works provided for in the schedule of prices, the same shall be executed by the contractor at such prices as may be agreed for with the Engineer-in-Chief; but if the contractor and the Engineer-in-Chief cannot agree as to the price to be paid, the Engineer aforesaid may order and direct the same to be done by such person or persons as he may think fit.

Net measurements.

6. All measurements of the works shall be made according to the actual dimensions, notwithstanding any general or local custom to the contrary.

Labour, materials, plant, &c.

7. The contractor shall provide at his own costs and charges all materials, labour, tools, plant, tackle, machinery, scaffolding, &c., for the proper completion of the works at the prices stated in his schedule or tender.

Contractors liable for injury to adjoining lands, properties, &c.

8. In executing the several works herein specified, or conveying materials thereto, the contractor must be careful to do as little damage or injury to the adjoining lands or properties as possible, and he will be held answerable for the whole amount of such damage or injury, which may be deducted out of the moneys he may have in the hands of the Government.

Contractors to take the whole risk of executing the works properly.

9. The contractor shall take upon himself the whole risk of executing the works to the satisfaction of the Engineer-in-Chief, and in accordance with the plans, sections, and specifications, of the correctness of which he must satisfy himself.

Setting out works.

10. The works will be set out for the contractor, but he must satisfy himself of their accuracy, as no work incorrectly set out or improperly executed will be paid for by the Government.

Contractor to be represented.

11. The contractor at all times during the progress of the works, when he is not personally superintending them, must have a responsible agent or overseer stationed on them to receive instructions from the Superintending Officer or Engineer-in-Chief, and to represent the contractor for all the purposes of this contract.

Progress of works.

12. Should the Engineer be at any time dissatisfied with the mode of proceeding, or at the rate of progress of the works or any part thereof, he shall have full power without vacating this contract to take the works wholly or in part out of the hands of the contractor, and to procure, employ, and make use of all labour or materials which he may deem necessary for completing the works, the cost of such labour and materials to be deducted from any money that may be then due, or may thereafter become due to the contractor; and if the money then due or thereafter becoming due to the contractor shall not be sufficient for that purpose, the balance remaining unpaid may be recovered in an action for damages for breach of contract or as money paid for the use of contractor.

Cancellation of Contract.

13. The Government or the Engineer-in-Chief shall have the option, and full power and authority, in lieu of proceeding under the last preceding clause of these conditions, if the contractor fail to proceed in the execution of, and to carry on the works in the manner and at the rate of progress required by the Engineer, of cancelling this contract so far as relates to the works remaining to be done; and in such case the moneys which shall have been previously paid to the contractor on account of the works executed shall be taken by him as full payment for all works done under the contract; and upon notice in writing under the hand of the Engineer-in-Chief that he, under the authority of this condition, cancels the contract, being served upon the contractor, or left at his last-named place of abode, the contract shall be cancelled; and thereupon all sums of money that may be due or unpaid to the contractor, together with all implements in his possession, and all materials provided by him, upon the ground upon which the work is being carried on, or adjacent thereto, shall be forfeited, and all sums of money named as penalties for the non-fulfilment of the contract within the time specified, shall also be forfeited and become payable to the Government, and the said implements and material shall become and be the absolute property of the Government, and with the moneys so forfeited and payable as aforesaid shall be considered as ascertained damages for breach of contract.

Time of completion, &c.

14. The contractor shall complete the whole of the works comprised in this contract, on or before the thirty-first day of October, one thousand eight hundred and eighty-five, and in the event of their non-completion at the specified time, should the Engineer-in-Chief not have proceeded under clauses Nos. 12 and 13 of these conditions, or either of them, the contractor shall forfeit and pay (£100) one hundred pounds sterling for each day or for every part of a day that shall elapse after such specified time until their completion, and which sum or sums may be deducted from any money payable to the contractor under this or any other contract. No certificate will be given after the date specified in these conditions for the completion of the contract, until the whole of the works shall have been properly completed to

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the satisfaction of the Engineer-in-Chief, unless the time for the completion of the contract shall have been extended by the Minister for Works, in which case such extended time shall become the time for the completion of the contract, and it is to be expressly understood, that the fact of the time having been so extended shall not in any way be taken as a waiver of the contract, or as annulling or setting aside the contract in any respect, or be taken as releasing the contractor, or his sureties, from any of the responsibilities or obligations of the contract; which, in all other respects, shall remain the same as if the time had not been extended.

The like liability also shall hold good as to the obligations of contractor and sureties in the event of any advance to the contractor being made for the retention money, or on material on the ground and not *in situ*, and for the purposes of this contract it shall not be necessary to apprise the sureties of any extensions of time having been granted, or advances and payments made, as contemplated in this or other clause or clauses of these general conditions or of the specification.

Copies of drawings, &c.

15. All copies of drawings or specifications required by the contractor for carrying on the works must be made at his expense, but should any copies of drawings or specifications be furnished to him at the expense of the Government, they must be returned to this office before a final certificate for the work shall be given.

Liability of Contractor.

16. The care of maintenance of all works under this contract shall remain with the contractor until their completion, and until the Engineer-in-Chief for Harbours and Rivers shall, by notice in writing under his hand, inform the contractor that he has taken charge thereof; and until such notice shall have been given, the contractor shall be responsible for all accidents from whatever cause arising, and shall make good all damage thereto.

Contractor not to sub-let works or assign moneys.

17. The contractor shall not assign over or under-let this contract or any part thereof, or assign all or any of the moneys payable or to become payable under the contract, or all or any part thereof, or any other benefit whatsoever arising, or which may arise under this contract, to any other person, without the consent in writing of the Engineer-in-Chief for Harbours and Rivers first obtained. The contractor, for each and every breach of this condition shall pay to the Government the sum of £50 as and for liquidated damages; and the sum or sums payable as such damages may be deducted from any sum or sums due to the contractor under this or any contract with the Government. And any permission to assign over or underlet works to be done under this contract shall not discharge the contractor from liability to see that the works so assigned or under-let are executed and completed in terms of this contract.

Truck system not allowed.

18. The workmen, tradesmen, and labourers of every class employed on the works to which these conditions refer, shall be paid their wages, in full, in money, current coin of the Colony, at least once in every month, and no ticket or other system of payment by provisions, liquors, or goods, will on any pretence be allowed; nor shall the contractor, or any person or persons employed by him, or in any way connected with him, establish any shop for the supply of provisions, liquors, or goods; nor shall the contractor oblige his workmen to take provisions, liquors, or goods of any kind from any person in particular. The workmen of every class shall be paid on the works if it be possible, or in some building adjoining; and in no case shall they be paid at a public-house or other place where liquors or refreshments are sold.

Power to the Government to pay Workmen's wages.

19. Before the payment of any money to the contractor, the Engineer-in-Chief may require from him a statutory declaration that the tradesman and labourers of every kind employed on the works to which these conditions refer have been paid their wages and claims of every kind in full, in money, the current coin of the Colony, and to the latest date at which such wages or claims are due; and the Engineer-in-Chief may withhold the payment of any money that may be due or may become due to the contractor, until such declaration has been made and delivered to him.

If the contractor shall fail or omit to pay the wages of any workmen employed upon the works, in the current coin of the Colony, it shall be lawful for the Government, or the Engineer-in-Chief, as often as the same shall happen, upon complaint of such failure or omission made by any such workman, and upon production or other satisfactory proof of any judgment or order of a Court of Petty Sessions, or of any other Court of competent jurisdiction, to pay the amount mentioned in such order to such workman, and to deduct the same amount from any money then due or owing, or thereafter to become due or owing, to the contractor, under this contract.

Bankruptcy or Insolvency.

20. If the contractor shall become insolvent, have his estate placed under sequestration, or shall make an assignment of his estate for the benefit of his creditors, it shall be lawful for the Government without previous notice to the contractor, or to the official or other assignee or assignees of his insolvent estate, or to the trustee or trustees under the assignment, to take the works out of the hands of the contractor and of the assignees or trustees of his estate, and to recontract with any other person or persons to proceed with and complete the same, upon such terms, stipulations, and conditions as shall be deemed expedient; and all the then remaining materials, implements, and plant aforesaid may be used in and applied for the purposes of the works; but on the final completion of the works, the surplus of such materials, implements, and plant shall cease to belong to the Government and shall become the property of the said assignees or trustees, without any allowance for or payment by the Government, or on account of any loss or diminution, wear, tear, or injury they may have sustained in the meantime.

Security.

21. The contractor will be required to provide two approved persons as sureties, to enter with him into a bond to the Government jointly and severally, in the penal sum of six hundred pounds for the proper performance and completion of the contract; the names of the persons proposed by him as sureties must be stated in his tender, the Government reserving to itself the power of rejecting such proposed sureties should it deem it advisable to do so.

Should

Should the contractor fail to procure such persons as may be deemed by the Government to be eligible sureties, within six days from the acceptance of the tender, or should the contractor fail to execute the contract for the due performance of the works mentioned in the said tender, or to execute and procure the due execution by the persons so approved of as sureties of the bond required hereunder for securing the due completion of the works to be done under the said contract within fourteen days after the acceptance of such persons as sureties has been notified to him, the Government will have the option of and full power and authority to declare such acceptance to be annulled.

No tenderer will be allowed to proceed with the work tendered for until he has provided approved sureties, has executed the required contract, and has, with such sureties, duly executed the bond before mentioned for the due performance of the said contract—it being hereby declared that for all or any work done or materials found and provided by the contractor before the due execution of the said contract and bond, he shall not have any right of action, claim, or demand against the Government.

Progress payment without prejudice, &c.

22. No certificate given to the contractor for the purpose of any progress payment shall prevent the Engineer-in-Chief from, at any future time before the termination of the contract, rejecting all unsound materials and improper workmanship discovered subsequently to the giving of the last previous certificate; and notwithstanding the giving of any certificate that portions or the whole of the works have been satisfactorily performed, the Engineer-in-Chief may require the contractor to remove and amend at any future time previously to the final payment on account of the construction or maintenance of the works, any work that may be found not to have been performed in accordance with the contract; and the contractor must remove and amend at his own cost all such work when so required, notwithstanding any approval made or given by the Superintending Officer; and the Government shall have power, on the report of the Engineer-in-Chief that the work approved of as aforesaid is not in accordance with the contract, to deduct from any moneys that may be due or that may become due to the contractor, the whole amount that has been paid on account of the work.

If, in the opinion of the Engineer-in-Chief, further inquiry is necessary or desirable before any certificate is given, he shall have power to withhold such certificate for any period which he may consider necessary for the purposes of such inquiry, from the date at which in the ordinary course the certificate would have been given.

None of the conditions of this contract shall be varied, waived, discharged, or released, either in law or in equity, unless by the express consent of the Government, testified in writing.

Payments.

23. Payments may be made once in every month, unless the same shall become not payable by reason of anything contained in these conditions, up to the date specified for the completion of the contract, on the Engineer's certificate as the work proceeds, in the proportion of 75 per cent. of the value of the work satisfactorily executed, and the remaining 25 per cent. will be paid after the Engineer has certified that the whole of the works have been completed to his entire satisfaction, and that the period specified for the maintenance of the said works has expired; and it is expressly declared that the obtaining a certificate from the Engineer that the work done by the contractor has been satisfactorily executed or completed to his satisfaction shall be a condition precedent to the contractor having any right or cause of action in respect of any work done or material provided, and to the contractor having any right of action or claim to the payments from time to time to be made hereunder, as well as to the final payment upon the whole of the work being finished.

Maintenance.

24. The contractor will be bound to maintain the works for a period of six months after their final completion and use; and if any part should, within that period show signs of weakness or of giving way, or should any defective workmanship or materials be detected, the contractor when called upon to do so shall make good the same at his own cost, to the satisfaction of the Engineer-in-Chief, before the reserve balance will be paid.

E. O. MORIARTY.

Department of Public Works, Harbours and Rivers Branch,
Engineer's Office, Sydney, 7 July, 1885.

These are the general conditions, marked "D," referred to in our annexed bond to Her Majesty the Queen, dated the 3rd day of September, A.D. 1885.

HENRY HUDSON, Managing Director.
FRED. THOS. HUMPHERY.
JOHN WOODS.
JAMES ALEXANDER.
SAMUEL W. GRAY.

Witness—JOHN PORTUS.

No. 52.

Vouchers for Work done.

Head of service: Sydney Water Supply, 1884; payable from Vote of £553,000; item No. 26, 48 Vic. of Loan Act of 1884.

Contingent expenses—Department of Harbours.

Claimant: Hudson Bros. (Limited).

1st Instalment.

	£ s. d.
August 27, 1885. To advance on account of contract for temporary water supply to Sydney...	10,000 0 0
Total	£10,000 0 0

Signature of claimant,— HUDSON BROS. (Limited).

Approved. See M.P., 83-1841, W.S.—J.B., 27/8/85. We undertake to sign the bond when called upon to do so.—For Hudson Bros. (Limited), HENRY HUDSON. Approved.—F.A.W., 26/8/85.

Head of Service: Temporary Water Supply (S.W.S., 1884). Contingent expenses.—Department of Harbours and Rivers.

Claimant: Hudson Bros.

Sydney Water Supply Temporary Works.—2nd Instalment.

	£ s. d.	£ s. d.
September 9, 1885. To value of work performed	25,000 0 0	
Less 25 per cent.	6,250 0 0	
Previous payment	10,000 0 0	
		16,250 0 0
Total		£8,750 0 0

Signature of claimant,— HENRY HUDSON, Managing Director.

I certify that the amount charged in this voucher as to computations, castings, and rates is correct that the service has been faithfully performed; and that the expenditure is duly authorized in terms of the Audit Act. E.O.M.

C.W.D., 10/9/85.

Head of Service: Temporary Water Supply. Contingent expenses.—Department of Harbours and Rivers.

Claimant: Henry Hudson (for Hudson Brothers (Limited).

Sydney Water Supply Temporary Works—3rd Instalment.

	£ s. d.
September 30, 1885. To work done in connection with temporary water supply ...	46,000 0 0
Less 25 per cent.	11,500 0 0
	34,500 0 0
Less previous advances	18,750 0 0
Total	...£15,750 0 0

Signature of Claimant,—(For HUDSON BROTHERS, Limited)—HENRY HUDSON, Managing Director.

I certify that the amount charged in this voucher as to computations, castings, and rates is correct; that the service has been faithfully performed; and that the expenditure is duly authorised in terms of the Audit Act. E.O.M.

C.W.D., 30/9/85.

Head of Service; Temporary Water Supply, 1884. Contingent expenses.—Department of Harbours and Rivers.

Claimant: Hudson Brothers (Limited).

Sydney Water Supply Temporary Works.—4th Instalment.

	£ s. d.	£ s. d.
Oct. 26, 1885. To value of work done in connection with contract for temporary water supply	60,000 0 0	
Less previous payments	34,500 0 0	
„ 25 per cent. retention	15,000 0 0	
		49,500 0 0
Total		£10,500 0 0

Signature of claimant,— HUDSON BROTHERS (Limited).

I certify that the amount charged in this voucher as to computations, castings, and rates is correct; that the service has been faithfully performed; and that the expenditure is duly authorised in terms of the Audit Act. E.O.M.

C.W.D.

No. 53.

Messrs. Hudson Brothers to The Engineer-in-Chief.

Sir,

Redfern Works, Sydney, 26 November, 1885.

I have the honor to inform you that we experience most unexpected difficulties in making the joints of our pipes tight enough to withstand the great pressure exerted upon them at Duck Creek depression. We have been battling with this difficulty for over a week now, and have not yet succeeded in overcoming it, but are confident of being able to do so ultimately.

We were in hopes we should have been able to stop the leaks without turning the water off, but think we had better ask you to do so now, as we think we shall be able to get over the difficulty sooner.

This will also necessitate us asking for an extension of time, which I feel sure you will recommend, as when we made the offer to bring the water into Sydney we stipulated for cast iron pipes to be used in this length of the work, and the pipes to be supplied by the Government. After our offer was accepted it was found the Government could not procure the cast iron pipes, and we undertook to make them of sheet iron, without any additional charge; so now we trust you will recommend an extension of time be granted to us to make good the defects that have occurred in carrying out the scheme.

I have, &c.,

(For Hudson Bros., Limited),
HENRY HUDSON,
Managing Director.

[1s. 3d.]

Sydney: Thomas Richards, Government Printer.—1885.

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

TEMPORARY WATER SUPPLY FOR SYDNEY.

(FURTHER PAPERS.)

Ordered by the Legislative Assembly to be printed, 27 November, 1885.

Mr. H. Hudson to The Engineer-in-Chief for Harbours and Rivers.

Redfern Works, Sydney, 27 November, 1885.

Sir,

My attention has just been drawn to the report of the papers laid on the Table of the House in connection with the Temporary Water Supply, and I notice that special comment has been made on Mr. Grimshaw's letter. I would ask, in common justice to us, that you will acknowledge that we rectified every defect in that portion of the work, and that the whole of the works, from Simpson's Creek (the first creek we had to bridge) right through to Ettinger's, has been an absolute success.

You will remember that the cause of the lead coming out of the joints on this portion of the work was through the great expansion and contraction on the long length of pipes; but since the water has been turned into these pipes the leakage has entirely stopped.

I have, &c.,
HENRY HUDSON.

Memo. by Engineer-in-Chief for Harbours and Rivers.

(Forwarded for the information of Mr. Secretary Lyne.)

MR. HUDSON asks me to acknowledge that his firm have rectified every defect in the portion of the work for the Temporary Water Supply to which my attention was drawn in Mr. Grimshaw's letter of the 1st October. I have much pleasure in being enabled to state that such has been the case.

It is right I should add that I have, on every occasion, found the Messrs. Hudson anxious to meet my requirements and do all in their power to make the work a success.

They have, no doubt, had difficulties to encounter; but, with energy, skill, and perseverance, they will be satisfactorily overcome.

E. O. MORIARTY.

B.C., Under Secretary, Public Works.

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

SYDNEY WATER SUPPLY.

(RETURN IN REFERENCE TO TEMPORARY SUPPLY.)

Ordered by the Legislative Assembly to be printed, 4 February, 1886.

RETURN showing the record of the daily flow of water from the 30-inch pipe at Prospect to the lower Canal.

Date.	Quantity.	Date.	Quantity.
1885.	Gallons.	1886.	Gallons.
11 December ...	3,467,880	7 January	3,051,000
12 " ...	3,467,880	8 "	1,868,400
13 "	2,559,600*	9 "	2,322,000
14 "	2,559,600	10 "	2,424,600*
15 "	8,458,560	11 "	2,424,600
16 "	1,760,400	12 "	2,322,000
17 "	4,984,200	13 "	2,916,000
18 "	1,182,600	14 "	2,424,600
19 "	3,310,200	15 "	3,051,000
20 "	3,310,200*	16 "	2,559,600
21 "	3,310,200	17 "	2,797,200*
22 "	2,559,600	18 "	2,797,200
23 "	2,084,400	19 "	3,180,600
24 "	2,559,600	20 "	2,797,200
25 "	3,310,200	21 "	2,797,200
26 "	3,310,200	22 "	2,797,200
27 "	3,310,200*	23 "	2,559,600
28 "	3,310,200*	24 "	2,797,200*
29 "	3,310,200	25 "	2,797,200
30 "	3,569,400	26 "	3,969,000
31 "	3,310,200	27 "	2,797,200
1886.		28 "	2,983,500
1 January	1,085,400	29 "	3,834,000
2 "	3,310,200	30 "	3,834,000
3 "	3,310,200	31 "	3,051,000
4 "	1,868,400	1 February	3,051,000
5 "	2,559,600	2 "	3,051,000
6 "	2,203,200		

* Approximate.

The balance of the stream running down the upper canal was diverted into Prospect Dam, in which at the present time there are stored 430,000,000 gallons of water.

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

HUNTER RIVER WATER SUPPLY.

(PARTICULARS RESPECTING COST OF.)

Ordered by the Legislative Assembly to be printed, 3 *August*, 1886.

RETURN showing the Amount expended on the above Works to the 30th June, 1886, and the estimated cost of completing the same :—

No. 1.—Cost of Works to 30th June, 1886—278,255 1s. 10d.

No. 2.—Estimated cost of completing Works (without reticulation)—£23,000.

[3d.] 752—

1885–6.

NEW SOUTH WALES.

LANDS FOR PUBLIC PURPOSES ACQUISITION ACT.

(RESUMPTION FOR WATER SUPPLY, HUNTER RIVER DISTRICT.)

Presented to Parliament, pursuant to Act 44 Vic. No. 16, sec. 6.

NOTIFICATION OF RESUMPTION OF LAND UNDER 44 VICTORIA, No. 16.

NEW SOUTH WALES, to wit. } By His Excellency The Right Honorable Sir AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called Lord AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

(L.S.)
AUGUSTUS LOFTUS, *Governor.*

WHEREAS I, the Governor aforesaid, with the advice of the Executive Council of the said Colony, have duly sanctioned the carrying out of certain works for and in connection with the supply of water to the City of Newcastle, and the towns of Maitland, Morpeth, and the mining townships situated in the Hunter River District, in the said Colony, for and towards the completion of which said works public funds are available under the provisions of the "Appropriation Act of 1879;" and whereas the lands hereinafter described are required for the construction of the said works: Now, I, the Governor of the said Colony, with the advice of the Executive Council of the said Colony, in pursuance of the powers in this behalf given to or vested in me by the "Lands for Public Purposes Acquisition Act," do by this notification, published in the Gazette and in a newspaper, that is to say, in the "Maitland Mercury," circulated in the Police District wherein the said lands are situated, declare that the lands hereinafter described have been resumed for the public purposes hereinafter mentioned that is to say, for and in connection with the supply of water to the said City of Newcastle, and the towns of Maitland, Morpeth, and the mining townships situated in the Hunter River District, to the intent that, upon the publication of this notification in the Gazette, the legal estate in the said lands shall forthwith be vested in the Minister for Public Works and his successors, on behalf of Her Majesty, for the purpose of the said last-mentioned Act, for an estate of inheritance in fee simple in possession freed and discharged from all trusts, obligations, estate, interest, contracts, charges, rates, rights-of-way, or other easements whatsoever; and to the intent, further, that the legal estate therein, together with all powers incident thereto or conferred by the said Act, shall be vested in the said Minister as a trustee, with the powers stated in the said last-mentioned Act. And I declare that the following are the descriptions of the lands hereinbefore referred to, that is to say:—

1st. All that piece or parcel of land situated in the parish of Hexham, county of Northumberland, and Colony of New South Wales, being part of a grant of 1,280 acres, to Mrs. C. Brookes: Commencing at a point on the southern boundary of land already resumed for the purposes of the Hunter River District water supply, bearing south 26 degrees east 73 chains 67½ links from the north-west corner of the said 1,280 acres; and bounded thence by said southern boundary bearing south 20 degrees 13 minutes east 50 links; thence by a line bearing south 69 degrees 47 minutes west 26½ links; thence by 3 chains 59 links of a concave curve of 5 chains 81·06 links radius, the chord of which bears south 52 degrees 5 minutes west 3 chains 53½ links; thence by a line bearing south 34 degrees 23 minutes west 4 chains 64¼ links; thence by a line bearing south 55 degrees 37 minutes east 1 chain 26½ links; thence by a line bearing south 34 degrees 23 minutes west 2 chains 92 links; thence by a line bearing south 88 degrees 56 minutes west 3 chains 72½ links; thence by a line bearing north 34 degrees 23 minutes east 5 chains 8 links; thence by a line bearing south 55 degrees 37 minutes east 1 chain 26½ links; thence by a line bearing north 34 degrees 23 minutes east 4 chains 64¼ links; thence by 3 chains 90 links of a convex curve of 6 chains 31·06 links radius, the chord of which bears north 52 degrees 5 minutes east 3 chains 83¾ links; thence by a line bearing north 69 degrees 47 minutes east 26½ links to the point of commencement, containing 1 acre 2 roods 23 perches or thereabouts, and said to be in the possession and occupation of J. W. Brooks.

2nd. All that piece or parcel of land situated in the parish of Newcastle, county of Northumberland, and Colony of New South Wales, being part of a grant of 950 acres to James Mitchell, being also lots Nos. 54, 55, and 56, section 11, of a subdivision of part of the said grant called Burwood township: Commencing on the eastern side of the Lake Road at the south-western corner of lot No. 53 (which corner bears south 48 degrees 7 minutes west, and is distant 24 chains 86 links from Trigonometrical Station B); and bounded thence on the north by lot No. 53 bearing south-easterly 109 feet; thence on the east by lots Nos. 81, 80, and 79 bearing south-westerly 150 feet; thence on the south by lot No. 57 bearing north-westerly 109 feet to the eastern side of the Lake Road; thence on the west by that road bearing north-easterly 150 feet, to the point of commencement,—containing 1 rood 20 perches or thereabouts, and said to be in the possession and occupation of E. C. Merewether.

In witness whereof, I have hereunto set my Hand, and caused the Great Seal of the Colony to be hereto affixed, at Government House, Sydney, this twenty-ninth day of October, in the year of our Lord one thousand eight hundred and eighty-five, and in the forty-ninth year of Her Majesty's Reign.

By His Excellency's Command,
HENRY S. BADGERY.

GOD SAVE THE QUEEN!

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

WATER SUPPLY.

(RETURN RESPECTING RETICULATION PIPES, &c., FOR BATHURST, WAGGA WAGGA, GOULBURN, AND ALBURY.)

Ordered by the Legislative Assembly to be printed, 7 September, 1886.

[*Laid upon the Table in answer to Question No. 5, Votes No. 109 of 12 August, 1886.*]

RETURN showing the total cost in England of the reticulation pipes, special castings, &c., for towns of Bathurst, Wagga Wagga, Goulburn, and Albury, with the amount of trainage for conveyance of same to the said mentioned towns, and percentage of total cost the railway freight amounts to.

	Cost in England*	Percentage of total cost.	Commission in England, 2½ %.	Percentage of total cost.	Charges in Sydney, 3½ %.	Percentage of total cost.	Railway charges.	Percentage of total cost.	Total cost.
	£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.
Bathurst	6,193 16 7	or 66⅞	154 16 11	or 1⅝	215 16 8	2¼	2,701 8 4	29¼	9,265 18 6
Wagga Wagga.	2,902 18 3	or 65⅝	72 11 5	1⅝	101 12 0	2¼	1,355 18 0	30½	4,432 19 8
Goulburn	7,085 9 1	or 68⅛	177 2 9	1⅝	247 19 9	2¼	2,906 16 6	28	10,417 8 1
Albury	4,410 7 8	or 65	110 5 2	1⅝	154 7 2	2¼	2,119 17 4	31⅛	6,794 17 4

* This includes delivery at Circular Quay, the freights averaging it is understood about 17·3 per ton (having been paid by the contractors or 12½ % on English cost.

7 September, 1886.

E. O. MORIARTY.

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

BORING FOR WATER BETWEEN BOURKE AND WANAARING.

(COST OF, AND QUANTITY AND QUALITY OF WATER IN EACH BORE.)

Ordered by the Legislative Assembly to be printed, 1 *April*, 1886.

THURSDAY, 1 APRIL, 1886.

Question No. 4:—Mr. Wilkinson to ask the Secretary for Mines,—What is the total cost for boring between Bourke and Wanaaring since commencement in 1882, what length of road is watered by the bores, and what is the quality and quantity of water in each bore?

Answer:—Cost of boring, £3,889 14s. Fresh water has been obtained at 51 miles and 57 miles from Bourke, and a bore is now over 400 feet down at 75 miles from Bourke, but no fresh water yet. When this bore is finished, and another between the Kulkine Tank and Wanaaring, the boring on this line will be complete. It is proposed to complete the watering of the road by tanks and dams. The depths of the several bores and the quantity and quality of the water is given in the paper annexed.

BORES, Bourke to Wanaaring.

No. of Bore.	Quality of Water.	Quantity in gallons per day.	Remarks.
A, 18-mile post.....	Salt	9,200	Six tappings, viz., at 22 ft., 60 ft., 64 ft. 6 in., 66 ft., 69 ft., and 72 ft. below surface; depth of bore, 194 ft. 4 in.
B, 51 ,, ...	Fresh	1,000	Rose 8 ft. over surface; four tappings, viz., at 30 ft., 61 ft., 70 ft., and 89 ft. below surface; depth of bore, 89 ft. 2 in.
B1, 51 ,, ...	,, ...	Not given.....	Prospecting bore; depth, 34 ft. 6 in.
B2, 51 ,, ...	,, ...	1,450	Rose 21 ft. over surface; salt at 20 ft. shut off; depth, 114 ft.
B2, 2nd, 51,, ...	,, ...	1,450	Rose 21 ft. over surface; salt at 20 ft. shut off; depth, 103 ft.
B3, 51 ,, ...	,, ...	15,000	Rose 10 ft. over surface; six tappings, viz., at 80 ft., 100 ft., 106 ft., 122 ft., and 192 ft.; salt at 20 ft. shut off; depth 200 ft. 8 in.
C, 18 ,, ...	Salt	10,000	Eight tappings, viz., at 12 ft., 24 ft., 31 ft., 32 ft., 45 ft., 53 ft., 55 ft., and 198 ft.; depth, 198 ft. 3 in.
D, 57 ,, ...	Fresh	4,320	Salt from 23 ft. to 110 ft. shut off; brackish at 349 ft., 2,500 gallons per day; fresh at 427 ft., rose 3 ft. 3 in. over surface, 4,320 gallons per day; depth, 545 ft. 6 in.
E, 75 ,, ...	Salt	4,000	Salt tapped at 8 ft.; no other tapping up to date, March 27, 1886; present depth, 403 ft. 6 in.
F, 94 ,, ...	,, ...	5,000	Salt tapped at 22 ft.; depth, 31/12/85, 321 ft. 7 in.

1885–6.

NEW SOUTH WALES.

LANDS FOR PUBLIC PURPOSES ACQUISITION ACT.

(NOTIFICATION OF RESUMPTION OF LAND FOR SEWERAGE PURPOSES.)

Presented to Parliament, pursuant to Act 44 Vic. No. 16, sec. 6.

NOTIFICATION OF RESUMPTION OF LAND UNDER 44 VICTORIA No. 16.

NEW SOUTH WALES, to wit. } By His Excellency The Right Honourable CHARLES ROBERT, BARON CARRINGTON, a Member of Her Majesty's Most Honourable Privy Council, Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

(L.S.) CARRINGTON, *Governor.*

WHEREAS I, the Governor aforesaid, with the advice of the Executive Council of the said Colony, have duly sanctioned the carrying out of certain works for and in connection with the sewerage of the City of Sydney and its suburbs in the said Colony, for and towards the completion of which said works public funds are available under the provisions of the Act 48 Victoria No. 27, "Appropriation Act of 1885;" and whereas the lands hereinafter described are required for the construction of the said works: Now, I, the Governor of the said Colony, with the advice of the Executive Council of the said Colony, in pursuance of the powers in this behalf given to or vested in me by the "Lands for Public Purposes Acquisition Act," do by this notification published in the Gazette and in a newspaper, that is to say, in the "Sydney Morning Herald," circulated in the Police District wherein the said lands are situated, declare that the land hereinafter described has been resumed for the public purposes hereinafter mentioned, that is to say, for and in connection with the sewerage of the said City of Sydney and its suburbs, to the intent that, upon the publication of this notification in the Gazette, the legal estate in the said lands shall forthwith be vested in the Minister for Public Works and his successors, on behalf of Her Majesty, for the purpose of the said last-mentioned Act, for an estate of inheritance in fee simple in possession, freed and discharged from all trusts, obligations, estate, interests, contracts, charges, rates, rights-of-way, or other easements whatsoever; and to the intent further that the legal estate therein, together with all powers incident thereto or conferred by the said Act, shall be vested in the said Minister as a trustee with the powers stated in the said last-mentioned Act: And I declare that the following is the description of the lands hereinbefore referred to, that is to say:—

1st.—All that piece or parcel of land containing by admeasurement three roods six perches, situate in the parish of Alexandria, county of Cumberland, and Colony of New South Wales, and being a part of the estate known as the Barcom Glen Estate: Commencing at a point on the south-western side of Liverpool-street, distant south-easterly 102·2 links from the south-easternmost intersection of Liverpool-street and Great Barcom-street; thence running south-easterly by a line bearing 140 degrees 22 minutes 45 seconds along the south-western boundary of Liverpool-street for a distance of 112·57 links; thence south-westerly by a line bearing 30 degrees 47 minutes 2 seconds for a distance of 581·62 links; thence further south-westerly by a line bearing 51 degrees 23 minutes 33 seconds for a distance of 175·34 links to Campbell-street; thence along the north-east side of Campbell-street by a line bearing north-westerly 151 degrees 6 minutes 33 seconds for a distance of 107·6 links; thence north-easterly by a line bearing 51 degrees 23 minutes 33 seconds for a distance of 137·9 links; thence further north-easterly by a line bearing 30 degrees 47 minutes 2 seconds for a distance of 298·74 links; thence further north-easterly by a line bearing 51 degrees 14 minutes 25 seconds for a distance of 51·65 links; thence north-westerly by a line bearing 140 degrees 21 minutes 38 seconds for a distance of 19·16 links; and thence north-easterly by a line bearing 30 degrees 47 minutes 2 seconds for a distance of 246·5 links to the point of commencement, be all the bearings, area, and distances a little more or less,—being a strip of land 70 feet wide throughout, and said to belong to Mrs. D. C. F. Scott and Joseph Burdekin Holdsworth, and bounded on or towards the north-east by Liverpool-street, on or towards the south-east and north-west by other parts of the properties said to belong to Mrs. D. C. F. Scott and J. B. Holdsworth, and by a reserve for drainage and a lane 20 feet wide, and on or towards the south-west by Campbell-street.

2nd.—All that piece or parcel of land containing by admeasurement three roods thirteen perches and seven-tenths of a perch, situate in the parish of Alexandria, county of Cumberland, and Colony of New South Wales, and being a part of the estate known as the Barcom Glen Estate: Commencing at the north-easternmost corner of allotment numbered twenty-four in J. B. Holdsworth's subdivision of part of Barcom Glen Estate; thence running south-easterly by a line bearing 151 degrees 6 minutes 33 seconds along the south-western boundary of Campbell-street for a distance of 107·6 links; thence south-westerly by a line bearing 51 degrees 23 minutes 33 seconds for a distance of 381·1 links; thence further south-westerly by a line bearing 58 degrees 18 minutes 49 seconds for a distance of 224·74 links; thence westerly by a line bearing 270 degrees 52 minutes for a distance of 278·45 links to West-street; thence north-easterly by a line bearing 208 degrees 44 minutes along the south-east side of West-street for a distance of 119·9 links; thence easterly by a line bearing 270 degrees 52 minutes for a distance of 191·5 links; thence north-easterly by a line bearing 58 degrees 18 minutes 49 seconds for a distance of 137·35 links to Ice-street; thence south-easterly by a line bearing 148 degrees 43 minutes 33 seconds along the south-western side of Ice-street for a distance of 81·4 links; thence north-easterly by a line bearing 60 degrees 19 minutes along the south-eastern end of Ice-street for a distance of

50·03 links; thence north-westerly by a line bearing 148 degrees 43 minutes 33 seconds along the north-eastern side of Ice-street for a distance of 83·15 links; and thence north-easterly by a line bearing 51 degrees 23 minutes 33 seconds for a distance of 392·86 links to the point of commencement, be all the bearings, area, and distances a little more or less,—being a strip of land 70 feet wide throughout, intersecting street excepted, and said to belong to Jos. B. Holdsworth, Catherine Nichols, Naomi Dobson, Patrick Toner, John Stedman, Mrs. R. S. Dobson, Louisa Marshall, and Jane M. Haines, and bounded on or towards the north-east by Campbell-street, on or towards the south-east and south by other parts of properties said to belong to Jos. B. Holdsworth, Naomi Dobson, John Stedman, Mrs. R. S. Dobson, and Jane M. Haines, and by a reserved road on or towards the north-west by West-street, and on or towards the north and north-west by a property said to belong to Martha Goddard; by other parts of the properties said to belong to Louisa Marshall, Patrick Toner, and Catherine Nichols, and by Ice-street and a reserve for drainage.

3rd.—All that piece or parcel of land containing by admeasurement one rood six perches and eight-tenths of a perch, situate in the parish of Alexandria, county of Cumberland, and Colony of New South Wales, and being part of the estate known as Barcom Glen Estate: Commencing at the easternmost corner or angle of a piece of land conveyed by Thomas West to trustees for the use of the tenants as a water reserve; thence running south-westerly by a line bearing 208 degrees 44 minutes along the north-western side of West-street for a distance of 95·2 links; thence westerly by a line bearing 270 degrees 52 minutes for a distance of 160·85 links; thence north-westerly by a line bearing 290 degrees 12 minutes for a distance of 162·6 links to Great Barcom-street; thence north-easterly by a line bearing 247 degrees 53 minutes 50 seconds along the south-eastern side of Great Barcom-street for a distance of 157·6 links; thence south-easterly by a line bearing 290 degrees 12 minutes for a distance of 27·95 links; thence easterly by a line bearing 270 degrees 52 minutes for a distance of 198·75 links to West-street; and thence south-westerly by a line bearing 208 degrees 44 minutes along the north-western side of West-street for a distance of 24·7 links to the point of commencement, be all the bearings, area, and distances a little more or less,—being a strip of land 70 feet wide throughout, and said to belong to John E. Holdsworth, Mary Ann Wilcox, Charles D. Clements, Jane M. Holdsworth, Jos. B. Holdsworth, and to Henry Lane and Jos. B. Holdsworth, as trustees for a water reserve; and bounded on or towards the south-east by West-street, on or towards the south by other parts of the properties said to belong to the said John E. Holdsworth, Mary Ann Wilcox, Jane M. Holdsworth, and Jos. B. Holdsworth; on or towards the north-west by Great Barcom-street; and on or towards the north by other parts of the properties said to belong to Jane M. Holdsworth and Charles D. Clements, and by other parts of the water reserve.

In witness whereof I have hereunto set my Hand, and caused the Great Seal of the Colony to be hereto affixed, at Government House, Sydney, this twenty-third day of June, in the year of our Lord one thousand eight hundred and eighty-six, and in the fiftieth year of Her Majesty's Reign.

By His Excellency's Command,

W. J. LYNE.

GOD SAVE THE QUEEN!

Sydney: Thomas Richards, Government Printer.—188

[3*d*.]

1885-6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

MESSRS. A. FORSYTH & CO. *v.* MINISTER FOR PUBLIC WORKS.

(CORRESPONDENCE, &c.)

Ordered by the Legislative Assembly to be printed 30 *June*, 1886.

RETURN to an *Order* made by the Honorable the Legislative Assembly of New South Wales, dated 30th June, 1886, That there be laid upon the Table of this House,—

"Copies of all papers, letters, reports, minutes, and other documents, relating to the claim for compensation, and the action-at-law thereon, made by Messrs. A. Forsyth & Co. against the Minister for Public Works, tried in the Supreme Court in August, 1884."

(Mr. Forsyth.)

Commissioner's Minute.

MR. PIPER, look up all papers, and see me with them. I think this should be opposed for legal reasons.

Copies of all the papers are herewith, but confidential correspondence between the Crown Solicitor and Department, and an opinion of Mr. Salomon's, which it is not desirable should be made public, as it might prejudice case if again brought into court. W.C.B., 24/6/86.

SCHEDULE.

643—A

[805 copies—Approximate Cost of Printing (labour and material), £9 5s. 0d.]

MESSRS. A. FORSYTH & CO. *v.* MINISTER FOR PUBLIC WORKS.

No. 1.

A. Forsyth & Co. to Mr. J. M. Smail.

Sir, 6 January, 1883.

We would draw your attention to the dangerous state of Bourke-street where the sewerage works are going on. Before the street was opened up we had a good road, but the contractors have torn up the part of it for traffic, and have taken no trouble to put the other portion in a passable state.

It is now almost impossible to get a load through, being both dangerous and cruel to horses to have to drag a load through the street in its present condition.

We would ask you to compel the contractors to make a fair temporary road as they open up the street, and also to put that part where the street is already opened up in a passable condition.

A. FORSYTH & CO.

No. 2.

Mr. J. M. Smail to Stewart & Co.

Sirs, Sewerage Office, Bourke-street, 6 January, 1883.

Messrs. Forsyth have complained about state of temporary road along side of sewer trench. Will you be good enough to have such temporary track kept in trafficable order, so as to obviate any further complaints.

I remain, &c.,

J. M. SMAIL.

No. 3.

A. Forsyth & Co. to Mr. J. M. Smail.

Sir, 10 February, 1883.

We again draw your attention to the dangerous and almost impassable state of Bourke-street where the sewerage works are going on.

It is now impossible to get a load to town from our factory by going south to Elizabeth-street, and Bourke-street north of our factory is almost as bad, so that we are almost stopped from carrying on our business.

If the street is not put in a fair passable condition at once we shall see the Minister of Public Works about it, and if that has no effect we shall summon the contractors.

A. FORSYTH & CO.

This letter was attended to by contractor repairing the temporary track the following Monday morning.—J.M.S.

No. 4.

The Engineer-in-Chief to Mr. J. M. Smail.

Department of Roads and Bridges, Sydney, 24 February, 1883.

Messrs. Alderson & Forsyth have called with reference to the road in Bourke-street; they say that contractor has made road impassable and for the last three months has done nothing. By contract he is bound to keep road in repair, and they state that in lieu of doing so he is filling in the ballast.

W. C. BENNETT.

Why did not Mr. Smail report or forward the complaints of Messrs. Alderson & Forsyth? Mr. Smail,—Report on separate paper herewith.—J.M.S., 24/2/83. The Engineer-in-Chief.

No. 5.

Mr. J. M. Smail to The Engineer-in-Chief.

Superintending Officer's Report on Engineer-in-Chief's memo. *re* complaint by Messrs. Alderson and Forsyth.

In answer to the Engineer-in-Chief's memo., 24/2/83, I beg to state that the portion of the road referred to is not impassable, but from force of circumstances is heavy in places. I saw Mr. Forsyth, junior, this morning, and asked him to show me the portion of the road he particularly referred to. It turned out to be a length of about 4 chains from Lachlan-street upwards; this was rutted in places on one track, there being sufficient room to avoid the rutted portion, as the sewer trench had been filled in on the above length. Mr. Forsyth is the only one on the road who has complained to me. He sent me a letter on the 6th January complaining of the state of temporary road in the vicinity of his works. I wrote to the contractor informing him of the complaint, and he spread some ballast on the track, which, I understood, satisfied Mr. Forsyth. When the 30-inch main broke and caused a breach in the road, the track was naturally contracted, and caused a temporary inconvenience to traffic. On the first opportunity this track was made wider and passable, although heavy; this could not be otherwise from the nature of the soil. The contractor is aware of the fact that he has to maintain temporary roads during the progress of the works, for it has been impressed on him several times by myself. I certainly never considered the track so bad as represented to the Engineer-in-Chief. I think it is obvious if carts with a double load of bricks, weighing close upon 3 tons, can traverse the road without danger, the local traffic is not likely to

be

be interfered with to the extent that it is made out. I endeavour to inconvenience local traffic as little as possible; but I think that it will be allowed that carrying out work of the description we are doing through a sandhill, and the original ballasted track being little more than 12 ft. wide, and in very bad repair at places, it is impossible at all times to keep a first-class track available. I have informed Mr. Forsyth the ruts he pointed out would be filled in. In reference to contractor filling in the ballast taken off road as filling it is not correct. It would not pay the contractor to pay 6s. or 7s. a yard for ballast to supply the place of that used as filling. I did not forward the complaints to the head office, as I did not consider them of sufficient importance to warrant me doing so.

J. M. SMAIL,
24/2/83.

Inform Messrs. Alderson and Forsyth, and that Mr. Dyson reports Elizabeth-street is being repaired.—W.C.B., 26/2/83. Messrs. Alderson and Forsyth informed, 27/2/83.

No. 6.

The Engineer-in-Chief to Mr. A. Forsyth and The Hon. W. M. Alderson, M.L.C.

Department of Public Works,
Office of Commissioner and Engineer for Roads and Sewerage,
Sydney, 27 February, 1883.

Sirs,

Referring to the interview I had with Mr. Forsyth, Mr. Alderson, and yourself on Saturday last, with reference to the condition of a certain portion of road in Bourke-street, in the vicinity of your works, I have the honor to inform you that Mr. Smail, who has charge of the Sewerage Works in the Southern Division, reports that the portion of road referred to is not altogether impassable, but, from continual traffic, is rather heavy in some places, and that the part complained of appears to be a length of about 4 chains from Lachlan-street upwards. This was rutted in places on one track; but as the sewer trench had been filled in on the above length, there was sufficient room remaining to avoid the rutted portion; and when you complained about the road the contractor was informed that he would have to repair any damage done, which he accordingly did by laying ballast on the track, and this was understood to meet with your approval. The contractor has since been reminded that he is expected to maintain temporary roads during the progress of works, in accordance with the terms of his contract.

Respecting repairs to Elizabeth-street, Mr. Dyson reports that he has had men employed during the past week breaking in ballast and clearing off sand, and so soon as this is completed the metal will be put on.

I have, &c.,
WILLIAM C. BENNETT,
Engineer-in-Chief for Sewerage.

No. 7

Mr. A. Forsyth to The Engineer-in-Chief.

Sir,

We are in receipt of your letter of the 27th ultimo *re* sewerage works in Bourke-street, for which we beg to thank you.

The information given in Mr. Smail's report is incorrect and misleading. He says the road is not altogether impassable; if he means for foot passengers, horsemen, or empty drays, he is correct, but as to loaded drays it cannot be passed over with more than half a load and having double the number of horses, and then only after being repeatedly stuck up in the sand, and when he states that "as the sewer trench had been filled in" where the road was the worst "there was sufficient room remaining to avoid the rutted portion" he is simply misleading you. There was neither ballast nor any other covering on the sand to enable a loaded dray to go along the portion of road referred to, and it still remains in the same state.

There were some slight repairs effected a few days after Mr. Alderson and the writer interviewed you, but they are altogether insufficient and impose on us a heavy daily loss *besides serious interruption to our business for which we will have to seek redress* unless the road is at once put in a reasonably passable state. A visit will prove all we state.

I am, &c.,
A. FORSYTH.

Mr. Smail.—W.C.B., 7/3/83. Report herewith.—J.M.S., 15/3/83.

No. 8.

Mr. J. M. Smail to The Engineer-in-Chief.

Sewerage, Sydney, 15 March, 1883.

Subject;—Messrs. Forsyth & Co. complaining of state of Bourke-street, Waterloo, on sewerage works in progress.

In reply to Mr. Forsyth's letter of date, I beg to state that I take exception to Mr. Forsyth's statement that my report is "incorrect and misleading." What I have stated are actual facts and can be borne out by the Inspector and others on the works. As to the road being only passable for "horsemen, empty drays," and the like, is simply nonsense. I have seen as well as from information kept on the work that loaded drays, not half-loads, could pass along without the sticking-up and obstructions stated by Mr. Forsyth; further, Mr. Forsyth's own drays have passed along with a load drawn by two horses, which I would consider a good load for the road before it was ever touched by the contractor. The road will be restored to a passable state when the filling in is sufficiently consolidated to receive the ballast taken up, which I think any unprejudiced person will admit was very small for a ballasted road. The length we have dealt with in the vicinity of Mr. Forsyth's works had no ballast in places; others very scant. It appears

to

to me that Mr. Forsyth wants to bounce either the contractor or the Department into making a good ballasted road for him, which he never could get the Borough Council to do. His nephew has admitted to me that the road some time ago was so bad that they had to send men to put stone on the road to make it passable. The length of ballasted road we have yet to deal with, viz., from 42 chains to 59 chains and from 79 chains to 87 chains, is in as bad a condition as any road could possibly be, and during the time I have dealt with the southern drainage nothing beyond putting a few loads of ballast in some very bad holes has been done to it. Mr. Forsyth's captiousness dates some time back; he started first by objecting to the sewer being taken up the centre of the road as he said it would interfere with his business as he would not be able to get in or out. This was not borne out, for when the sewer was being taken past his premises he was put to no inconvenience on this score. I further beg to add that the other business people recognizing the importance of the work in hand, accept the temporary provision made for them and do not object to the slight inconvenience they are put to until the whole road is available for them, and as to the concluding statements of Mr. Forsyth's letter, underlined,* his reason for saying so is best known to himself, but personally I consider them exaggerated.

* *Italics.*

J. M. SMAIL.

P.S.—Contractor has been instructed to restore the road surface on that portion of sewer completed and consolidated. Mr. Forsyth might be informed accordingly.

Inform.—W.C.B., 16/3/83. Informed, 16/3/83.

No. 9.

The Engineer-in-Chief to Mr. A. Forsyth.

Department of Public Works,
Office of Commissioner and Engineer for Roads and Sewerage,
Sydney, 16 March, 1886.

Sir,

In answer to your letter of instant, having reference to the condition of the road in Bourke-street, Waterloo, I have the honor to inform you that Mr. Small reports that he has instructed the contractors to restore the road surface over that part of sewer which is now completed, and the contractors have again been reminded that they are expected to maintain temporary roads during the progress of works in accordance with terms of their contract.

I have, &c.,
WILLIAM C. BENNETT,
Engineer-in-Chief for Sewerage.

No. 10.

Mr. J. Williamson to The Secretary for Public Works.

Williamson's Chambers, King-street, Sydney, 4 April, 1883.

Dear Sir,

I am instructed by Archibald Forsyth and Company, of the rope works, Waterloo, to demand from you the sum of five hundred pounds (£500) for damages sustained by their firm by reason of injuries sustained by them through the cutting up and removing the soil of the roadway in opening and constructing the sewerage over and through the roadway by which my clients have to approach their manufactory and rope-works, situate at Waterloo.

My clients estimate that they are at least put to the expense of forty pounds (£40) per week through the above injuries, and therefore I must request your immediate attention to this notice in order that the damages may be stopped by the repairing and making of the same roads, and the prevention of any further annoyance or injury to my clients.

Yours, &c.,
JOHN WILLIAMSON,
Per N.B.

Roads, B.C., 9/4/83.—J.R.

No. 11.

The Engineer-in-Chief to The Under Secretary for Public Works.

Sewerage, Sydney, 11 April, 1883.

Report on Mr. A. Forsyth's complaint *re* state of road leading to his works.

The road through which the sewer is being made was over a sandhill 1 chain wide. Some four or five years ago a narrow track 18 feet wide, of soft stone, was made through it by the Waterloo Council, leaving a margin of deep sand on each side. The sewer passes through the centre of the street. The old stone, which was very scanty, was taken up by the contractor, put on the side to make a temporary track, but being insufficient has disappeared in the sand under the traffic, which has now to pass over a very heavy road.

Mr. Forsyth has given some hemp refuse from his works which makes the draft easier. Though the contractor is bound to keep up temporary roads I could not equitably call upon him to supply sandstone for that purpose; indeed I doubt if he could obtain sufficient in time to make it useful, and I think the sand road complained of is better than a new stone road would be for some time, and when the sewer was completed all stone put in such temporary roads would be useless for permanent purposes.

The contractor will be obliged to supply free to the Government equal to about half the stone on road, to make up loss and waste; this will cost him (say) £230.

With a view to obviate cause of Mr. Forsyth's complaint, I would advise that this amount be supplemented by an equal sum from the Government, to be applied to putting 1½ cube yards to the lineal yard of approved ballast on road, which will make it much better than it ever has been, but this should only be done on condition that Mr. Forsyth withdraws all claims for damages sustained, or to be sustained, from this cause, and the offer should be made without prejudice.

I think it better to expend some money in doing more than we have a right to do to a road than to spend the amount in law.

W.C.B., 12/4/83.

Submitted. I approve of the Commissioner's suggestion as to amicable settlement, although it is evident that Messrs. Forsyth's damage is entirely overstated at £40 per week. The sooner the offer is made, and "without prejudice" the better, as the claim is an accumulating one; of course it must be not only without prejudice but on the understanding that Messrs. Forsyth withdraw their claim.—A.S., 13/4/83. J. Williamson, Esq., 19/4/83.

No. 12.

The Under Secretary for Public Works to Mr. J. Williamson.

Sir, Department of Public Works, Sydney, 25 April, 1883.

Referring to your letter of the 4th instant, forwarding claim of Messrs. Forsyth & Co., for damage to road leading to their property by the Sydney Sewerage Works, I am directed to inform you that it is found that the contractor's loss to supply stone, replace what has been taken up on this road, will amount to £230, and the Secretary for Public Works proposes, without prejudice, if your clients will waive all claim in this matter that an equal sum will be granted by the Government to put the road in thoroughly good order.

I have, &c.,
JOHN RAE.

No. 13.

Mr. J. M. Smail to The Engineer-in-Chief.

Sydney Sewerage, Botany, 13 July, 1883.

Subject:—*Re* road repairs, Bourke-street, Waterloo.

With reference to the above case I wish to draw the Engineer-in-Chief's attention to the fact that Mr. Forsyth informed me last Wednesday, 11th instant, that their action against Government had not been withdrawn, and whatever was done to the road would not affect their claim, as the repairs were a matter between the Waterloo Council and the Government.

Under the circumstances would it be advisable to proceed with the improvements?

J. M. SMAIL.

I think the repairs should be proceeded with; I have verbally instructed Mr. Smail to proceed. We are in possession of very conclusive evidence of the prior state of road should Mr. Forsyth go to law. —W.C.B., 14/7/83. Under Secretary, B.C. Submitted. Let work be proceeded with at once.—F.A.W., 17/7/83.

No. 14.

Mr. A. Forsyth to The Secretary for Public Works.

Subject:—Mr. A. Forsyth claiming £1,000 for damage to his business, Bourke-street.

Returned from Crown Solicitor, with front page of sheet, containing Mr. Forsyth's claim, torn off.—1/12/85 (after the trial).

I append report of the meeting of the Waterloo Council on 12th October, 1882, which is, I think, sufficient evidence of the state of the road before our operations commenced. The 121st section provides that a sufficient road shall be maintained; we are in a position to prove that a road was maintained "in a state as convenient for passengers and carriages as the road so interfered with, or as nearly so as may be," and that in accord or in excess of the 122nd section the road will, when restored, be better than ever it was; and with regard to the 90th section the road was kept as free from all obstructions and annoyances as practicable.—W.C.B., 20/7/83. Under Secretary, B.C. Submitted.—J.R., 23/7/83. Seen. Push on reformation of this road as fast as possible; and I wish a good job made of it.—F.A.W., 25/7/83. Mr. Bennett, B.C., 26/7/83.—J.R. Send copy to Mr. Smail, with a request that he will at once report progress. Should not some communication be made to Crown Solicitor?—W.C.B., 27/7/83. Copy made and sent to Mr. Smail, 30/7/83. Mr. Piper, B.C. Upon inquiry at Crown Solicitor's Office I ascertain that they have already received letters on this subject from Mr. Forsyth, and advise that these papers be forwarded to them, with instructions how to act.—F.C.P., 2/8/83. Engineer-in-Chief for Sewerage.

No. 15.

Extract.

From *Daily Telegraph* of 16/10/82, *re* Bourke-street, Waterloo.

Municipal Councils.

Waterloo.—An ordinary meeting of this Council was held on the 13th instant. Present—The Mayor (Alderman Hogan), with Aldermen Evans, Gray, Harrisky, Cole, Mulder, and Smith. James Schinell complained of the wretched state of the footpath in Elizabeth-street, and offered to contribute a moiety of the cost of asphalting. Alderman Mulder thought the applicant had not much need to grumble, and after some little discussion the letter was received. The resignation of Alderman Nelson was accepted and Alderman Mulder interjected a regret that his late *confrère* had made such a fool of himself and the Council, and had put the borough to expense. The local manager of the A.J.S. Bank drew attention to the fact that the account was overdrawn to the extent of £792 7s. 3d., and requested a guarantee before this amount was increased; received. The Tramway Department intimated, in reply to a complaint regarding the dusty state of the Botany Road, that all lines were watered once daily. A general opinion was

was expressed that this necessary work could at present be more efficiently done with a watering-pot. A petition from a number of ratepayers, drawing attention to the disgraceful state of Bourke-street, and stating that several accidents had lately occurred, consequent upon negligence in not filling up the holes for which the street is now noted, was received. A report from the Inspector, intimating, among other matters, that the clearing of the gutters was not attended to in a satisfactory manner, was also received. A considerable amount of discussion ensued regarding a water-trough in front of an hotel on the Botany Road, which the authorities want removed, as it interferes with the tram traffic. The Mayor explained the circumstances of the case. Alderman Mulder was furious at such an attempt being made to interfere with the liberty of the subject, and complained of some of the aldermen wishing to throw dirty water in a ratepayer's face. The matter ultimately lapsed. It was stated that several accidents had lately occurred in Bourke-street and Botany Road, consequent upon the defective state of the same; and Alderman Gray suggested that the difficulty be overcome by signing the required guarantee, and getting the funds from the Bank.

A correspondent writes—"Bourke and Botany streets, Waterloo, are at present in a very defective state, the former especially so, being literally full of holes. The consequence is that accidents are almost of daily occurrence. In Bourke-street drays are continually bogged. The other night a cabman was flung from his seat, and yesterday a cart loaded with malt was upset, and the shaft horse injured. An accident also occurred yesterday in Botany-street, owing to a large hole made in the road by a heavy waggon. It appears that the driver of a light cart not noticing the trap drove into it, and as a consequence he was jerked out, severely injured, and had to be conveyed home in a cab. The Council excuse themselves for this undesirable state of things on the plea that they have no money. Such a plea, however, would not hold good in a Court of law; and as the expense involved in one single action would more than cover the cost of necessary repairs, it is hoped the aldermen will give these streets early attention."

No. 16.

Mr. J. M. Smail to The Engineer-in-Chief.

Sewerage, Sydney, 31 July, 1883.

Repairs to Bourke-street, Waterloo.

The Contractor has restored the road surface up to 2 miles 4 chains, and is continuing same to the Redfern boundary.

The work being done by the Department is making good progress. The length of road at present improved is 77 lineal yards; if greater progress is required I will have to put on more men; at present I have two engaged.

There is a good firm track from Forsyth's to top of hill, capable of carrying any loading likely to be put upon it.

J. M. SMAIL,
31/7/83.

In four or five days it will be better than when work commenced. Put on more men; keep an accurate account. File.—W.C.B., 31/7/83.

No. 17.

Mr. J. M. Smail to The Engineer-in-Chief.

Sewerage, Sydney, 9 April, 1884.

Witnesses expenses in case Forsyth *v.* Wright.

Two witnesses, Lawler and Ringrose, have applied to me for their expenses for the days they were in attendance at Court. I asked them to submit their claim in writing; I forward them herewith. Mr. Walsh, they say, promised to pay them, but as he is on circuit he cannot do so. The applicants want the money before Easter.

I have drawn out vouchers for the amounts (total, £5 2s.), the claims having been reduced to what I consider a fair allowance. The Engineer-in-Chief might grant the application as it appears a case of necessity.

J. M. SMAIL.

Pay—give cheque in advance.—W.C.B., 9/4/84. Mr. Piper. Cheque drawn; money will be forwarded to Mr. Smail to morrow.—F.C.P., 9/4/84. Witnesses paid. Vouchers herewith.—J.M.S., 17/4/84.

No. 18.

A. Forsyth & Co. to The Acting Secretary for Public Works.

Sir,

339 Kent-street, Sydney, August, 1884.

We beg to lay before you the following particulars relating to the sewer made by your Department, in Bourke-street, Waterloo, by which we have sustained a large amount of injury and loss.

The works commenced in November, 1882, near to our rope works. This portion of Bourke-street runs through a sandhill; on this sand a roadway 20 feet wide was made with sandstone ballast. It was not a good road but on it we were able to carry loads of 2 tons and over with a pair of horses.

The sewer excavation was made in the centre of the ballasted track, and where it was opened compelled us to go with our carts over the naked sand. The Act under which the works were carried out provides that the Board shall before breaking up any road, make a temporary one, and maintain it in as good condition as the one interfered with during the time the works are being carried out. As we had great difficulty in carrying on our traffic through loose sand, we applied several times to the resident inspector under the Board; he promised to have a substituted road made, but nothing was done. We

wrote

wrote and interviewed Mr. Bennett, Commissioner for Sewers, several times; but although he promised to have a temporary road made nothing was done, and matters got worse as the cutting got extended, for although the sand was filled into the excavation in some portions the ballast was not restored until August, a period of nine months, during which we were compelled to carry the traffic on through the naked sand for a distance varying at different times from 400 yards to 900 yards, and compelled to reduce our loads from 2 tons to 1 and sometimes to 15 cwt., and had often to employ three horses for this quantity on this portion of the road; the number of loads per day had likewise to be reduced.

In July, failing to get the Board to do anything to the road, we sent a notice of the injury and damage we had sustained, claiming compensation, in accordance with the 129th section of the Act.

During the above period the road was in such a bad condition that we ruined four of our horses, which became unfit for our work, and had to be sold at great loss. Our vehicles and harness were often broken and damaged (and subsequent to the notice for compensation one valuable horse died from the effects of the work), but, apart from the loss by horses, vehicles, and harness, the cost of our cartage from diminished loads and reduced number per day was doubled; previous to the breaking up of the road it cost 5/- per ton, after not less than 10/.

The Act, section 130, prescribes that within 60 days after receipt of notice for compensation the Minister shall cause an appraisement to be made of the injury and damage, and shall inform the claimant of such appraisement; but no notice of such appraisement has been made to us up to present date.

In October our legal advisers were of opinion that an action would lie at common law, and, as this form of action did not require the appraisement mentioned in the Act, it was deemed advisable to sue at common law, and a writ was issued against the Minister in November last. The action was tried last May's sittings, and resulted in a verdict for the plaintiffs for £700. On this verdict the Minister applied to the full Court to have the verdict entered for the defendant. The case was argued before the full Court on the 8th inst., and the verdict was entered for the defendant.

It will be seen from the judgment of the Full Court (a report of which we append), that the Minister had failed to do either of two things directed by the Act to be done by him: He had not made an appraisement nor denied his liability, so that the only two modes contemplated by the Act for recovering damage is closed against us.

Such being the state of the case we now ask you to have the appraisement made of the injury and compensation claimed, and as counsel for the Minister stated that the damage awarded by the verdict was excessive, we are willing to place our books under the inspection of such appraiser from which he can ascertain the actual amount of cartage done during the period that the road was broken up, and likewise gain information on loss from horses, vehicles, and harness, and as regards the extra cost of cartage. Although the track in its then state cannot be seen it can be pretty correctly estimated from the nature of the soil, and information can be got from many persons (not interested in the amount of compensation) that went over the road during the construction of the sewer, and in addition such appraiser can read the evidence from the Judge's note, a verified copy of which is in our possession.

As regards the heavy costs incurred by the trial we will no doubt have to bear our own costs, but we respectfully submit that as this abortive trial has arisen through the Minister's non-compliance with the provisions of the Act, it is only fair that the Board should forego their costs in the case. No doubt the Board can legally enforce the payment of their costs, but we hope that, standing as you do in the present case as the representative of the Government, you will prefer justice to law, as has been frequently done in the past both by the Government and Legislature when dealing with individuals.

Trusting you will give this matter early attention and have an appraisement made of the injury and compensation claimed, and carefully consider the grounds on which we ask you to forego the costs of the Board in the late action,

We have, &c.,
A. FORSYTH & CO.

Mr. Bennett, for report.—G.R.D., 14/8/84. B.C., 15/8/84.—J.R. This is a legal matter and the paper should go on to the Crown Solicitor. I attach a minute made on the Crown Solicitor's letter of 8th instant, with reference to this case.—W.C.B., 18/8/84. Under Secretary, B.C. Forward to Crown Solicitor.—J.R., B.C., 21/8/84.

No. 19.

Extract from *Sydney Morning Herald.*

SUPREME COURT—THURSDAY, AUGUST 7.

In Banco—(Before their Honors the Chief Justice, Mr. Justice Faucett, and Mr. Justice Innes.)

FORSYTH AND ANOTHER V. WRIGHT.

Mr. M. H. Stephen, Q.C., Mr. Salomons, Q.C., and Mr. C. B. Stephen, instructed by the Crown Solicitor, appeared on behalf of the defendant to move that the rule *nisi* granted on the 29th July to enter the verdict for the defendant be made absolute.

Mr. Owen, Q.C., Mr. W. J. Foster, and Mr. Edmunds, instructed by Mr. J. Williamson, appeared in opposition to the rule.

The arguments in this case were resumed and concluded.

Mr. Salomons submitted that plaintiffs must go for compensation under the 129th, 130th, 131st, and 132nd sections of the Metropolitan Water and Sewerage Act, and even if an action could be brought under those sections, notice was required under the 147th section of the Act, and this was not given. Even if the defendant denied his liability, plaintiffs were bound, before commencing their action, to give notice, but they had not done so. The case was very similar to that of Olenshalager v. the Commissioner for Railways, heard a few days ago.

Mr. C. B. Stephen, on the same side, also argued that if the Government denied their liability, they were entitled to notice under the 147th section of the Act, and this notice had not been given.

Mr. Owen contended that in all cases of compensation under the Act it was provided that the cases must fall under one or other of the two categories; either it must be a case in which there had been a denial of liability, or a failure to arrive at an agreement between the claimant and the Minister. This was not a case of denial, and it must be taken as a case of non-agreement, and therefore plaintiffs were entitled, under the 129th and 130th sections of the Act, to bring the action. As to the ground whether the action could be properly brought outside the Act, he submitted that it could properly be brought for injury done by the Minister, not in carrying out works under the authority of the Act, but in doing certain works which he was not authorized to do at all by the Act. By section 121, which was the section under which this action was brought, it was provided where it was considered necessary to cut through a road that before they put a pick into the road or disturbed a stone they must make and maintain a road equally good. The section said "that the Board shall, before the commencement of any such operations, cause a sufficient road to be made instead of the road to be interfered with, and shall, at the public expense,

expense, maintain such substituted road in a state as convenient for passengers and carriages as the road so interfered with, or as nearly so as may be." He submitted that before they broke up the road so as to make it "more than usually inconvenient" for traffic they must make and maintain a substituted road. No doubt the Government considered it necessary, for the purpose of making the sewer, that they should cut through the road, but before they did that they were bound to make a convenient substituted road; and the gravamen of the plaintiff's complaint was that the Minister did not do this, and that they cut through the road and made it impassable. The Act only authorized the Minister to break up the road after he had made a substituted road, but he did this before making a substituted road. Section 129 did not in the least refer to the present case, because the injury plaintiffs suffered from was not any injury done under the Act, but because the Minister had not done something which he ought to have done under the Act, namely, making a substituted road. He contended that whether the action was taken to be under the Act or outside the Act, it was properly brought.

Mr. Foster, on the same side, argued that the word "compensation" referred to compensation for work done under the Act, and was limited to that, but compensation for work not done under the Act was provided for by law.

The Chief Justice said that under the Metropolitan Water and Sewerage Act, 43rd Vic., No. 32, section 40, paragraph 5, power was given to the Minister for Works to enter upon any lands, streets, roads, or thoroughfares, and construct and lay, or place therein any drains or pipes, and may repair, alter, cut-off, or remove the same, or may enter upon such lands, streets, roads, or thoroughfares for the purpose of repairing any watercourses or other works being the property of the Government or under their control, provided that the Minister shall make full compensation for all damage or injury committed in the exercise of such powers, and the amount of such compensation shall, in every case where the owner or claimant cannot agree, be ascertained and be dealt with under the provisions of the Act. By section 121 of the same Act it was enacted—"If, in the exercise of the powers hereby granted, it be found necessary to crosscut through, raise, sink, or use any part of any road, whether carriage road, horse road, or tram road, or railway, either public or private, so as to render it impassable for, or dangerous, or more than usually inconvenient to passengers or carriages, or to the persons entitled to the use thereof, the board (previously the Minister) shall, before the commencement of any such operations, cause a sufficient road to be made, instead of the road to be interfered with, and shall, at the public expense, maintain such substituted road in a state as convenient for passengers and carriages as the road so interfered with, or as nearly so as may be." The Minister for Works, armed with these powers, proceeded to perform certain works in a street in this city, and these works were of such a character as to interfere with the road in which they were constructed, so as to make it less convenient than it was before. Plaintiffs, being possessed of a rope walk, which was approached or approachable with vehicles only by means of this road, were interfered with in their business by what defendant did; and for the injury which they sustained by the performance of these works, and by not making, as required by the 121st section of the Act, a roadway equally convenient while these works were in progress and while the impediment was in existence, they sued for damages; and in the second count they set out the circumstances he had mentioned, and the damage they sustained by reason of the Minister not keeping the roadway, and a convenient roadway, in good order. To all the counts of plaintiffs' declaration the defendant had pleaded "that the claims of plaintiffs are in respect of certain alleged damage and injuries sustained by them by reason of the construction of certain works done under the authority of the Act 43 Vic., No. 32, in respect of which plaintiffs have given notice of claim for compensation; that the defendant has not denied any such liability in respect to the matter, and that the defendant says that the report and appraisement of the nature and amount of such injury or damage, as required by the 130th section of the Act, has not yet been made nor notified to the plaintiffs, whereby the amount of compensation, under the 131st section of the Act, cannot be decided or tried in this action." The case went down for trial, and the jury found on the second issue for the plaintiffs, with £700 damages. Leave was reserved to apply for a new trial, or to enter a nonsuit, or that the verdict which was given for the plaintiff should be entered for the defendant; and that was the matter which they had now to determine. Well, the Act under which this interference with the road took place and which has given rise to this action and controversy, was, so far as regarded the subject matter of this inquiry not easy to determine. He could see that the clauses were to a large extent, as was frequently the case in matters of this kind, copied from other enactments, and sometimes the sections were not drawn with that precision which was desirable in sections of this character. Some things were clear enough in this enactment. The power given to the board, and in the absence of the board, to the Minister, to do this work, was very plain. By the 93rd section there could be no question that authority was conceded to enter upon these public roads and interfere with them in the way it was interfered with in this case, and it was quite clear that any compensation that might be demandable for anything done in carrying out the provisions of the enactment must be dealt with, not at common law, but under the provisions of the Act. Power was given very plainly indeed, and it was also pointed out that full compensation could be demanded by persons who were injured by the performance of these works; and it was pointed out with equal plainness that the compensation to be given should be ascertained under the provisions of the Act. Then by the 121st section it was plain that if a road was interfered with in such a way as to render it impassable, dangerous, or more than usually inconvenient, a sufficient road must be made and maintained in its stead, and must be made before the commencement of these operations which created this impassable or inconvenient condition of things. All that was plain enough. Now they had to see what were the provisions made for ascertaining the amount of compensation, and they came to clause 129, which was in these terms:—"Every person claiming compensation in respect of any injury or damage sustained by him by reason of the construction of any works under this Act, or of any work or other matter done under the authority of this Act (not being injury caused by the permanent taking of land), shall serve a notice in writing upon the Minister, and a like notice upon the Crown Solicitor, which notice shall set forth the nature of the injury or damage which he has sustained, or will sustain by reason of such construction, work, or matter as aforesaid: Provided always that nothing in this part contained shall affect or prejudice the right of any such claimant to maintain an action in the Supreme Court as he might heretofore have done in case the Minister shall deny any liability in respect of the matter of the claim for compensation. But in every such case such action shall be subject to the provisions hereafter in p. 7 contained." The words were certainly comprehensive, and included a number of injuries to individuals done under the authority of the Act. What was done here was plainly under the authority of the Act, and whether it was done negligently or not was perfectly immaterial because it was only when the requirements of the Act had not been attended to, and when the provisions of the Act were not complied with, that a cause of action would arise. The cause of complaint was that something which the Act required to be done had not been done, and that was one of the causes of damage specially pointed out by the enactment. The section said that notice of such injury or damage should be served upon the Minister, and a like notice for the Crown Solicitor, setting forth the nature of the injury or damage the claimant had sustained, and that was done. Plaintiffs being injured as they alleged, and as no doubt they were, served this notice upon the Minister and upon the Crown Solicitor. And then there was the proviso which said: "Provided always that nothing in this part contained shall affect or prejudice the right of any such claimant to maintain an action in the Supreme Court as he might heretofore have done in case the Minister shall deny any liability in respect of the matter of the claim for compensation." Now, in part 7 in section 147, paragraph 2, it was provided that "no plaintiff shall recover in any such action unless notice in writing have been given to the defendant twenty-eight days before such action is commenced of such intended action, signed by the attorney of the plaintiff, specifying the cause of such action." A number of other things were provided, none of which was done in this case. The requirements of the 147th section were taken to apply only to cases mentioned in the proviso of section 129, and the provisions which were to govern all actions were given in paragraphs 1, 2, and 3 of section 147; so that the 147th section referred it back to the proviso of the 129th section, and the proviso of section 129 referred it back to section 147, one referring to the other. Thus the requirement as to the mode of procedure applied only to those cases which were included in the proviso, and the proviso dealt only with cases where the Minister should deny his liability. Well, that was not the case here, because it was proved that there was no denial of liability, and the plea asserted that the Minister did not deny his liability in the matter; so, as a matter of fact, both by the evidence and by the pleadings, there was no denial; and therefore these requirements in the 147th section did not apply to this action. In this action it was not at all necessary that the plaintiffs should give twenty-eight days' notice, or fulfil any other of the requirements of the 147th section. The plaintiffs' case did not come within that section, as it was a case where there was not only no denial of liability but an admission of liability. That being so, what other case arose? In the 130th, 131st, and 132nd sections the Legislature pointed out what other course was to be taken where there was no denial of liability. Under the 130th section there was a provision that sixty days after the receipt of any notice of claim, a report and appraisement of the nature and amount of such injury or damage should be made, and that the claimaint should be informed as soon as practicable of the substance thereof by notice. The Minister did not fix the amount himself, but appointed a person to report, and, having obtained the report, communicated the substance to the person claiming. Then the 131st section provided that "if, within ninety days after the service of the notice of claim, the claimaint and the

Minister

Minister shall not agree as to the amount of compensation, the claimant shall be at liberty to institute proceedings in the Supreme Court in the form of an action for compensation against the Minister as nominal defendant." That might be the subject of more or less correspondence and interviews. It appeared in this case that there was a considerable amount of correspondence, and, unfortunately, by reason of the correspondence being without prejudice, and the parties not agreeing to have it before the Court, it did not come before them. However, there was a considerable amount of correspondence, which resulted in no agreement, there was no report, and the things which were contemplated by the 31st section were not done. All these things were required to be done where there was no denial of liability. Then section 132 provided the issue to be disposed of in reference to the report. Disposed of in what sort of case? Disposed of in a case where damage has been sustained, and the Minister did not dispute it, and admitted his liability. The issue to be tried was "whether the claimant was entitled to a larger sum by way of compensation than the amount so reported to the Minister, and notified to the claimant as aforesaid; and, if so, to what sum?" Now the issue there to be determined by the jury was, whether the plaintiff was entitled to a greater amount than the amount of the valuation made by the person to whom the question was referred by the Minister. If the plaintiff got a greater sum, the Minister paid the cost; and if it was a sum equal to or less than the valuation, the plaintiff paid the costs. An essential ingredient in the issue was as to the amount of the valuation. If there was no valuation, or reference to a valuator, what was the issue to go to the jury? It was idle to say, if they made no valuation, that it was equivalent to a refusal of compensation, because, if that were so, they would regard it as an intimation that nothing was to be paid, it would come under the 129th section. If it was a refusal to pay anything it would be a refusal to pay compensation, and then the 129th section would apply. But there was no refusal of compensation, and that being so the course to be taken was pointed out by the Act. The things which the Act required had not been done, and, therefore, he thought the defendant's plea was made out, and being a perfectly good one, and fully established, he thought the rule ought to be made absolute to set aside the verdict, and direct it to be entered for the defendant. No doubt there was a case here which was not provided for by the Act as it ought to have been—that was to say, that the Legislature did not appear to have contemplated the possibility, where there was a claim for compensation, of the Minister not setting the valuator in motion, as was the case here, and not taking steps to enable the plaintiff to set the sections of the Act in motion. It might be that a special action could be framed against the Minister for not obeying the Act, and putting plaintiff in a position to succeed, but with that they had at present nothing to do. Possibly a special action might be maintained under these sections, but that was not the action they had to deal with now. They had to deal with an action brought plainly and unmistakably under this Act, and, as the requirements of the Act had not been complied with, he was of opinion that the action could not be maintained.

Mr. Justice Faucett and Mr. Justice Innes concurred generally with the learned Chief Justice, and expressed an opinion as to the hardship inflicted upon plaintiffs owing to the Minister not having carried out the provisions of the Act in regard to valuation.

Rule made absolute to set aside verdict for plaintiffs, and to enter the verdict for defendant.

No. 20.

Minute from Engineer-in-Chief to Under Secretary for Public Works.

Sydney, 16 August, 1884.

Subject:—Re action Forsyth *v.* Wright—Reply to Crown Solicitor's letter of 8/8/84.

We are not prepared to admit the plaintiff's claim for compensation for damages in this matter as we do not think he has suffered any through our operations and cannot therefore suggest any sum to offer.

The 121st section of the Act states that "the Board shall before the commencement of any such operation cause a sufficient road to be made instead of the road to be interfered with, &c."

If the interpretation of the clause is to the effect that before the work is commenced a sufficient road in lieu of the one to be disturbed shall be made ready for traffic throughout the whole length to be operated on in contract before any work is done, then the Department has not carried out provisions of same, but if on the other hand it may be interpreted that before any section of road is opened up a sufficient length of substituted road shall be available for traffic in lieu of that interfered with, then the Department has fulfilled the conditions of the section.

If Messrs. Forsyth's claim for damages is entertained then all the business people on the same road have the same right of claim. To grant compensation in this case would be establishing a dangerous precedent and on principle the claim should be resisted.

W. C. BENNETT,
16/8/84.

No. 21.

A. Forsyth & Co. to The Secretary for Public Works.

Sir, Sydney, 2 September, 1884.

At the interview our Mr. Forsyth had with you yesterday we are afraid he failed to lay before you the matter properly as was intended. We will now endeavour briefly to do so.

The Metropolitan Water and Sewerage Act of 1880 provides two modes for assessing and recovering compensation for injury sustained by individuals through works carried out under the Act, namely, when liability by the Minister is denied, and when liability is not denied, by the Minister.

In the former case section 147 prescribes the mode of procedure, but as the Minister did not deny his liability redress under this section was closed against us.

In the latter case, when liability is not denied, sections 129, 130, 131, and 132 prescribe the course to be followed both by the Minister and the claimant. Section 129 prescribes that persons claiming compensation shall serve a notice on the Minister of the injury and damage claimed, and section 130 prescribes that the Minister shall within sixty days of the receipt of such notice (unless he denies liability) cause a report and appraisement to be made and inform the claimant of such appraisement. By section 131 it is provided that if the Minister and claimant should not agree as to the amount of compensation within ninety days from the date of the notice the claimant shall be at liberty to sue in the Supreme Court subject to the 132nd section. Now section 132 provides that the only issue to be tried is whether the claimant is entitled to a larger sum than the appraised amount.

Now as no appraisement has been made by the Minister (although we gave due notice according to the Act) this issue cannot be put and the second mode of assessing and recovering compensation is closed against us, through the Minister's non-compliance with the directions of the Act as to appraisement. Now we respectfully submit you are in duty bound to carry out the law and have an appraisement made, to enable us to have this question settled by agreement or tried on its merits by law.

You will no doubt consider it your duty to ask Mr. Bennett to report on this matter, but we respectfully submit that as the works by which we sustained the injury were carried out by him in such

a way as to cause the injury it cannot be expected that he will report in our favour and against himself and his department, and that at this stage the question has gone beyond his department into that of the Minister or Ministry.

We have, &c.,
A. FORSYTH & Co.

I should like the Crown Solicitor to take counsel's opinion as to the liability of the Crown to be cast for damages in this case if the plaintiff should take the proper course in law?—F.A.W. Crown Solicitor, B.C., 4/9/84.—J.R.

No. 22.

A. Forsyth & Co. to The Secretary for Public Works.

Sir, 339 Kent-street, Sydney, 30 June, 1885.

Having called on the Under Secretary for Public Works a great number of times during the last four weeks with reference to our claim against the Government for compensation for the injury sustained by us during the construction of the sewer in Bourke-street, Waterloo, by your Department, and as Mr. Rae states that the papers sent in by us cannot be found, we herewith enclose copy of letter sent
See No. 19: in to you on 2nd September, likewise *S. M. Herald's* report of the trial before the Full Court. There was a previous letter sent in to the Department in August more fully setting out the circumstances of the case which has been mislaid, but with the exception that the letter asked the Government to refund the costs of the trial in the Supreme Court paid by us—and this request was withdrawn at the interview we had with you on 1st September; both letters are substantially to the same effect.

You will see from the Judge's decision that we got a verdict for £700, and that this verdict was entered for the defendant on the ground that as no appraisement was made there was no issue to go before the jury under the Act.

We have, &c.,
A. FORSYTH & Co.

No. 23.

A. Forsyth & Co. to The Secretary for Public Works.

Sir, 339 Kent-street, Sydney, 2 September, 1884.

At the interview our Mr. Forsyth had with you yesterday we are afraid he failed to lay the matter properly before you as was intended. We will now endeavour to do so.

The "Metropolitan Water and Sewerage Act of 1880" provides two modes for assessing and receiving compensation for injury sustained by individuals through work carried out under the Act, namely, when liability is denied, and when liability is not denied, by the Minister.

In the former case (when liability is denied) section 147 prescribes the mode of procedure, but as the Minister did not deny his liability, redress under this section was closed against us.

In the latter mode (when liability is not denied) sections 129, 130, 131, 132, prescribe the course to be followed both by the Minister and the claimant. Section 129 prescribes that persons claiming compensation shall serve a notice on the Minister of the injury and damage claimed, and section 130 prescribes that the Minister shall within sixty days after the receipt of such notice cause a report and appraisement to be made (unless he denies liability), and inform the claimant of such appraisement. By section 131 it is provided that if the Minister and claimant should not agree as to the amount of compensation within ninety days from the date of the notice, the claimant shall be at liberty to sue in the Supreme Court subject to the 132nd section of the Act. Now section 132 provides that the only issue to be tried is whether the claimant is entitled to a larger or smaller sum than the appraised amount.

No appraisement having been made by the Minister, although we gave due notice according to the Act, the issue cannot be put and the second mode of assessing damage and recovering compensation is closed against us, through the Minister's non-compliance with the directions of the Act as to appraisement.

Now we respectfully submit you are in duty bound to have an appraisement carried out to enable us to have this question settled by appraisement or tried on its merits before the Supreme Court.

You will no doubt consider it your duty to ask Mr. Bennett, Chief Engineer for Sewers, for his report on this matter, but we respectfully submit that at this stage the case has gone beyond the range of his Department. The works by which we sustained this injury were carried out by him in such a way as to cause this injury. It cannot be expected that he will report in our favour and against his Department; it is now a question for the Minister or the Ministry.

We have, &c.,
A. FORSYTH & Co.

No. 24.

Minute from Under Secretary for Public Works to Engineer-in-Chief.

Department of Public Works, Sydney, 8 July, 1885.

Forsyth and Co.'s claim for damage, Bourke-street sewerage works.

WHAT does Mr. Bennett recommend to be done? Mr. Forsyth, for an appraisement to be made of the damage to enable him either to accept the award or appeal to the Supreme Court? J.R.

Previous paper, 84/5/77, was forwarded to Under Secretary on 1/9/84 for transmission, I believe, to Crown Solicitor.—F.C.P., 9/7/85. Engineer-in-Chief for Sewerage. I never saw the paper from Mr. Forsyth stated by C.S. to have been withdrawn by Mr. Forsyth.—W.C.B., 9/7/85. Under Secretary. Submitted, 10/7/85. But what does Mr. Bennett recommend?—J.R., 10/7/85. Whatever the Crown Solicitor thinks advisable, I think the original claim should be resisted; as to the claim for costs Crown Solicitor is the best judge.—W.C.B., 10/7/85. Under Secretary, B.C. Crown Solicitor's advice had better be obtained.—F.A.W., 14/7/85.

No. 25.

No. 25.

Forsyth & Co. to The Honorable F. A. Wright.

(Private.)

Dear Sir, Sydney, 5 August, 1885.

I received a communication last week from the Department of Public Works *re* Bourke-street sewer. It states the Government will resist our claim for compensation, and are prepared to defend any action we may bring.

I do not know if this statement applies only to an action at law, or whether it is intended to go behind the understanding arrived at at our chance meeting in Bathurst-street last week. If the former, we will take the necessary steps to carry out the matter as understood at our meeting; if it is to be taken in the latter sense it will be useless to address your Department any further. Will you please give us an early answer.

Yours truly,

A. FORSYTH.

For my successor, waiting opinion from Crown Law Officer.—F.A.W., 6/11/85. Prepare *précis* of case.—J.R., 14/11/85. Done, 16/11/85.

No. 26.

Précis of case.

Messrs. Forsyth and Co.'s claim *re* Bourke-street sewer.

Department of Public Works, Sydney, 16 November, 1885.

Messrs. A. Forsyth and Co. brought an action against the Government for compensation for alleged damage to property by reason of the Bourke-street sewer works, and a Supreme Court jury awarded them £700 damages, but in consequence of an erroneous course of proceeding having been adopted by them of their own motion the verdict of the jury was set aside and the same entered for the defendant. They subsequently asked that the Government pay the costs of the action (which the Crown Solicitor thinks should be rejected) and also award them compensation, to which the Commissioner for Roads decidedly objects. Messrs. Forsyth and Co., on the 5th August last, refer to some conversation which took place between the late Secretary for Public Works (Mr. Wright) and Mr. Forsyth, the purport of which, however, is not disclosed.

J.R.

Submitted, 16/11/85.—J.R. For my successor.—W.J.L., 17/12/85. Re-submit end of December. Submitted, 4/1/86.—J.R.

Sydney: Thomas Richards, Government Printer.—1886.

[9*d*.]

1885–6.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

MESSRS. A. FORSYTH & CO. *v.* MINISTER FOR PUBLIC WORKS.

(FURTHER PAPERS.)

Ordered by the Legislative Assembly to be printed, 4 August, 1886.

FURTHER RETURN to an *Order* made by the Honorable the Legislative Assembly of New South Wales, dated 30th June, 1886, That there be laid upon the Table of this House,—

"Copies of all papers, letters, reports, minutes, and other documents, relating to the claim for compensation, and the action-at-law thereon, made by Messrs. A. Forsyth & Co. against the Minister for Public Works, tried in the Supreme Court in August, 1884."

(*Mr. Forsyth.*)

Minute from Under Secretary for Public Works.

Messrs. Forsyth and Co.'s claim *re* Bourke-street Sewer.

Department of Public Works, 16 November, 1885.

MESSRS. A. Forsyth and Co. brought an action against the Government for compensation for alleged damage to property by reason of the Bourke-street sewer works, and a Supreme Court jury awarded them £700 damages, but in consequence of an erroneous course of proceeding having been adopted by them, on their own motion the verdict of the jury was set aside, and the same entered for the defendant. They subsequently asked that the Government should pay *its costs of the action (which the Crown Solicitor thinks should be refused) and also award them compensation to which the Commissioner for Roads decidedly objected.

Messrs. Forsyth & Co. on the 5th August last refer to some conversation which took place between the late Secretary for Public Works (Mr. Wright) and Mr. Forsyth, the purport of which is not disclosed.

J.R.

The Under Secretary for Public Works to Messrs. Forsyth & Co.

Gentlemen, Public Works Department, Sydney, 27 July, 1885.

Referring to the correspondence respecting the costs incurred by you in your action against the Government, and also again asking compensation for injuries alleged to have been sustained by the Bourke-street sewer, I am directed to inform you that your claim for the costs referred to cannot be admitted. I am to add that the Government will resist your claim for compensation, and are prepared to defend any action you may be advised in the matter.

I have, &c.,
JOHN RAE.

* NOTE:—Instead of "the."

[3*d.*] 757—

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